The American Journal of Surgery

VOLUME 100 DECEMBER 1960 NUMBER SIX

Symposium on Maxillofacial Surgery

Treatment of Parotid Tumors

T. G. BLOCKER, JR., M.D., *Galveston, Texas*

From the University of Texas Medical Branch Hospitals, Galveston, Texas.

THE diagnosis of many lesions of the parotid gland still presents considerable difficulty preoperatively. It is sometimes impossible to obtain a precise diagnosis at the time of surgery for suspected malignancy. Fifty-four patients have been operated upon for tumors of the parotid during the past five years on the Plastic and Maxillofacial Service at the University of Texas Medical Branch Hospitals. Two of these had normal glands with fibrofatty tissue; seven had inflammatory lesions (one related to an oral malignancy); one had sarcoidosis in conjunction with lung disease; four had branchial cleft cysts starting at the tail of the parotid and extending posteriorly (one with malignant change); and one had a sinus tract in the aural canal. The remaining thirty-nine cases (1955 to 1960) were classified as follows:

I. Benign lesions (28)
   A. Complex adenomas (21)
      1. Primary (18)
      2. Recurrent (3)
   B. Papillary cystadenoma lymphomatosum (Warthin's tumor) (2)
   C. Hemangiomas (2)
   D. Parotid cysts (2)
   E. Fibroangiomas (1)

II. Malignant lesions (11)
   A. Adenocarcinomas arising in complex adenomas (4)
   B. Adenocarcinomas (1)
   C. Mucoepidermoid carcinomas (2)
   D. Epidermoid carcinomas (3)
   E. Sarcomas (1)

Since the review of all tumors of the parotid gland treated at our institution from 1906 to 1954 [3], a somewhat lower incidence of malignancies in relation to the total number of tumors has been noted, and primary mixed tumors are smaller than those formerly seen. This is probably due to earlier referral and the development of awareness of the danger signals of cancer on the part of the public. Two of the three patients with recurrent mixed tumors had primary surgery here. Two others, who had multiple recurrences and malignant change, had initial surgery elsewhere. One of these had so many recurrences over a period of forty years that the lesions could never be controlled in spite of extremely radical surgery with resection of a portion of the mandible, nerve, and surrounding skin. She eventually died of heart disease but still had an oral-cutaneous fistula and unsatisfactory skin coverage of the defect.

It has been our practice to approach parotid lesions as conservatively as possible with respect to sacrifice of the facial nerve, and the literature reveals a growing tendency toward this point of view [1,6,7,9,10]. In one patient with a complex adenoma it was necessary to sever partially the mandibular branch because of the location of the tumor in the deep lobe

of the gland. In other benign cases (including two Warthin's tumors) the nerve has been dissected away carefully after identification of the various branches with the aid of an electric stimulator and lesions have been removed *en bloc* with an adequate margin of normal tissue. The only indications for enucleation rather than superficial lobectomy have been either very small lesions on the external surface of the gland or the so-called "hidden" parotid tumor which presents itself at the angle of the jaw but extends medially into the pterygoid space. Since it lies on a bed of fine areolar tissue, it may be rather easily removed by blunt dissection with a periosteal elevator but time and care should be taken to preserve the nerve filaments. The bed is so vascular in this location that enucleation is the only feasible method of extirpation of the lesion.

Although malignant tumors can usually be recognized by fixation and infiltration, the diagnosis by frozen section is occasionally in doubt. The deformity produced by paralysis of the seventh nerve results in such extreme psychic trauma that I now believe it should be spared except in extensive lesions which involve or lie in close proximity to the main branch. In place of radical removal of malignancies I have attempted to preserve the nerve by dissecting out the tumor and employing interstitial irradiation by the rolled flap technic and have obtained very good results. The skin flap is rolled upon itself and sutured with loose interrupted stitches through the subcutaneous tissue of the flap to the premalar skin. Low intensity radium needles are used at the time of surgery (with dosage controlled by the radiological consultant) to provide from 6,000 to 7,000 gamma roentgens throughout the tumor bed and over an adequate area surrounding the site of the lesion. After four to ten days, when the needles are removed, the undamaged flap is unrolled and resutured in place. This technic brings irradiation directly to the tissue requiring therapy without the dangers and complications of massive external irradiation and with much more satisfactory results. Since the nerve is less radiosensitive than malignant tissue, the entire seventh nerve function is not usually disturbed although facial weakness of one or more branches may develop. External irradiation produces delay in wound healing, dermatitis, secondary infection and other complications if given in sufficient quantities to control the growth of the tumor. Therefore, it has been reserved for those patients with inoperable lesions in whom some active palliative treatment appears to be necessary.

We employ endotracheal anesthesia routinely for excision of parotid tumors and outline the skin flap according to the technic described by Brown, McDowell and Fryer [*4*], a modification of that first presented by Blair, Moore, and Byars [*2*]. The incision is begun inside the hairline in the temporal region and is extended anterior to the crux of the helix and over the edge of the tragus curving down and behind the lobe of the ear and terminating in the first flexion crease of the neck. This gives adequate exposure and an excellent cosmetic result.

In my opinion, radical neck dissection should be performed at the time of initial surgery for malignancy of the parotid if the cervical nodes are obviously enlarged. Otherwise, it is wise to wait for permanent pathological sections and definite establishment of the diagnosis before proceeding with removal of the neck glands. If definite firm nodules are found following adequate treatment of the primary lesion, neck dissection is indicated.

Cosmetic surgery for facial palsy following sacrifice of the seventh nerve is recommended just as in other types of paralysis. Conley [*3*] has recently outlined the various procedures in facial rehabilitation although Martin [*8*], who has reported spontaneous return of function in ten cases, urged that at least a year should elapse prior to reparative procedures.

All types of parotid tumors should be approached boldly, but conservatism should be exercised so far as the facial nerve is concerned. Complex adenomas and other benign lesions should be extirpated with a wide margin of normal tissue if they are well delineated, except for the very small superficial lesion and the "hidden" tumor, which may be enucleated. If there is no well defined pseudocapsule, a superficial lobectomy should be performed. Recurrent mixed tumors should be treated by total parotidectomy with preservation of the nerve since more than one discrete tumor may be evident on microscopic examination. Total parotidectomy should be performed for malignancies if the nerve is involved and the lesion is small or of moderate size. Extremely large lesions should be treated by palliative irradiation by the rolled flap technic. All others

should have extirpation of the tumor with preservation of the nerve in combination with interstitial irradiation. Differential diagnosis of parotid tumors should include, in particular, consideration of inflammatory lesions of various types and branchial cleft cysts. Alternate approach and management should be anticipated at the time of exploratory surgery.

REFERENCES

1. Ariel, I., Jerome, A. P. and Pack, G. T. Treatment of tumors of the parotid salivary gland. *Surgery*, 35: 124, 1954.
2. Blair, V. P., Moore, S. and Byars, L. T. Cancer of the Face and Mouth. St. Louis, 1941. C. V. Mosby Co.
3. Blocker, T. G., Jr., Lewis, S. R. and Snyder, C. C. Tumors of the parotid gland: approach and management. *J. Plast. & Reconstruct. Surg.*, 15: 102, 1955.
4. Brown, J. B., McDowell, F. and Fryer, M. Direct operative removal of benign mixed tumors of anlage origin in the parotid region. *Surg. Gynec. & Obst.*, 90: 257, 1950.
5. Conley, J. J. Facial rehabilitation following radical parotid gland surgery. *Arch. Otolaryng.*, 66: 58, 1957.
6. Conley, J. J. Surgical management of tumors of the parotid gland. American Academy of Ophthalmology and Otolaryngology, July-August, 1957. *J. Plast. & Reconstruct. Surg.*, 24: 409, 1959.
7. Kidd, H. A. Total parotidectomy with preservation of facial nerve: a review of forty-seven cases. *Brit. M. J.*, 2: 1309, 1955.
8. Martin, H. and Helsper, J. T. Spontaneous return of function following surgical section or excision of the seventh cranial nerve in the surgery of parotid tumors. *Ann. Surg.*, 146: 715, 1957.
9. Robinson, D. Operative treatment of tumors of the parotid gland. In: Current Surgical Management. Edited by Mulholland, J., Ellison, E. and Friesen, S. Philadelphia, 1957. W. B. Saunders Co.
10. Sumner, W. A clinical approach to parotid gland tumors. *Ann. Surg.*, 149: 852, 1959.

Cancer Quackery

JUSTIN J. STEIN, M.D., *Los Angeles, California*

From the Cancer Research Institute and the Department of Radiology, University of California at Los Angeles, School of Medicine, Los Angeles, California.

THE world has never been free of quackery in some form. In ancient times many of the priest-magicians were certainly quacks in the truest sense. Many people allegedly practicing medicine could neither read nor write, believed in charms and amulets and all types of superstitions and sacred remedies. Sorcery, witchcraft, and driving demons from the victims was part of their trade.

Quacks are not governed by any type of ethics, honesty or financial responsibility. They do not have to worry about performing any carefully controlled experiments or investigations in a scientific manner. The period of five years after treatment which is used as a guide to measure the results of treatment by ethical physicians and investigators means nothing to them for their motives are usually entirely selfish ones.

In 1860 Jeaffreson [1] wisely stated that, "The history of quackery, if it were written on a scale that should include the entire number of those frauds which may be classed under the heading of humbug, would be the history of the human race in all ages and climes. Neither the benefactors nor the enemies of mankind would escape mention; a searching scrutiny would show that dishonesty had played as important, though not as manifest, a part in the operations of benevolence as in the achievements of the devil."

THE PROBLEM

The modern quacks, in contrast to those of olden times who traveled by coach, or stage, or on horseback with their own accompanying entertainment, may even be graduates of a medical school. Fortunately, there are very few such persons. They may be outwardly polished with a smooth, ready tongue, and full of promises to the patient that they alone can cure when others have failed. His remedy is known only to him and must be administered by him. Those who disagree with him are attempting to keep him from "helping mankind." He readily states that he is being persecuted by the medical trusts. He may have imposing offices or have his own hospital. His equipment may be of the most modern type. Beneath it all, however, he is really a selfish, greedy person, a perpetrator of crime on his fellowman and a fraud of the worst type.

There is a great deal of emotional appeal associated with cancer. Those individuals suffering from this disease are frequently surrounded by well meaning persons who are ready to give advice which often is not to the patient's best interest. Many patients and their relatives are willing to grasp at any "straw" in the hope that a successful end result will be obtained.

To my knowledge there is no recorded case of cancer which has ever been cured by a secret drug or secret mechanical gadget. The only known methods by which a cure can be obtained at the present time are surgery, radiotherapeutic measures, or a combination of the two.

One-third of all patients with cancer are being saved at the present time by prompt recognition and appropriate treatment. The great tragedy is that cancer quacks will treat some patients with early curable lesions by worthless methods until it is too late for appropriate treatment to be instituted. Even patients with far advanced cancer can be greatly benefited by chemotherapy, hormone therapy and by the use of other tried and proven measures.

Aside from the loss of the money paid to the quack is the fact that many persons seeking their aid may never have had cancer in the first place and have to undergo needless mental anxiety and torture.

The cancer death rate is steadily increasing.

In 1934 the number of cancer deaths per 100,000 population was 106; in 1947 it was 132; in 1953 it was 145; and in 1956 approximately 250,000 Americans died of cancer. Included in this group were 4,000 children under five years of age, and 20,000 other patients between the ages of fifteen and forty-four. Approximately 700 Americans die of cancer daily [2].

The cancer quacks, who probably number in excess of 4,000 [3] in the United States, fleece their victims of some ten million dollars annually [4]. The fees for their services are not cheap. Fees for the worthless remedies and the advice which is dangerous to the patient's health may vary between three and six hundred dollars or more.

Cancer does not represent a single disease but a multiplicity of diseases, each with its own history and particular response to certain methods of therapy. If proper treatment is not instituted while the disease remains localized, the chances for survival diminish to the vanishing point. If the disease is not successfully cured, it may become widespread resulting not only in total disability and great suffering but also in considerable economic loss. Even in patients with extensive disease there is often a great deal which can be done.

Cases of spontaneous regression of cancer in which no treatment had been given are on record. This seldom occurs. Patients may have cancers which do not continue to grow but remain quiescent for indefinite periods of time. Should the quack treat a patient who happened to have a cancer which fell into either one of these categories he would certainly take all the credit.

DEFINITION OF QUACKERY

The Commission on Cancer [5] of the California Medical Association has defined a quack as having one or more of the following characteristics: (1) his treatment is available only from himself; (2) his treatment bears his own name or that of a high-sounding research organization; (3) his treatment is advertised; (4) he claims he is being persecuted by the medical trusts; (5) his cured patients and greatest supporters have only his word for it that they had cancer in the first place; and (6) he discourages or refuses consultations with reputable physicians.

It might also be added that very poor records or no records are kept and biopsy confirmation frequently has not been made. He will not permit other investigators to use his material in a carefully controlled clinical trial. Very influential persons may back him as has been the case many times in this country. He is also ready to institute legal action against anyone who dares oppose him or call him a quack.

One may ask the question, "How about the physicians who use approved methods of treatment but do so in an incompetent manner?" Examples are the radiologist who gives inadequate therapeutic doses of irradiation and the surgeon who performs inadequate resection or fails to remove an operable lesion because he does not have sufficient skill or knowledge. These physicians are not really quacks in the strict sense of the word, but they are really incompetent and it is unfortunate that they are in practice. It is hoped that more physicians of this type will be eliminated by elevation of the standards for admission to medical schools and through the normal attrition incident to obtaining a medical degree.

REASONS FOR QUACKERY

Many patients consult quacks in desperation, sometimes because they have been abandoned by their own physician. By being abandoned, I mean that the physician in charge of the patient states that there is nothing more to be done and then dismisses the case. In desperation the patient goes to the quack who offers hope without any scientific basis or method of treatment which could possibly give hope.

Some patients consult quacks because they have a fear of being operated upon or receiving irradiation. They may also believe that it will be much cheaper to consult a quack than a legitimate physician. Some people believe that all cancers are incurable.

The method by which some patients select their physician is surprising. They may merely ask an acquaintance or look in the telephone book and make no attempt to see whether the physician is trained to deal with the particular problem.

It has been stated that, "credulity is often due less to lack of brains than to lack of knowledge; but it is often easier to fool the intellectual when he is out of his depth than it is to take on the illiterate."

Quackery will continue as long as man continues to fail to fight fear with knowledge,

to grasp at straws without investigation, to enjoy taking medicines and to be hoodwinked.

COMMISSION ON CANCER

The Commission on Cancer of the California Medical Association which was organized in 1931 is made up of physicians who are particularly interested in cancer. The Commission has a full time medical director.

The California Medical Association, through the efforts of its active and effective Commission on Cancer, has been singled out repeatedly for its excellent work in this field. For example, one of the recommendations of the Committee on Cancer Diagnosis and Therapy, Division of Medical Sciences, National Academy of Sciences—National Research Council is, "that the state medical societies be encouraged to establish state or regional cancer commissions or committees to assume this responsibility following the general pattern developed by the California Medical Association and working in close cooperation with other local and national health agencies [6]." This specifically refers to the collection and evaluation of scientific and clinical evidence on unsubstantiated claims for the diagnosis and treatment of cancer.

The Commission has been very active in this state in professional cancer education, furthering cancer research, setting up minimum standards for Consultative Tumor Boards, encouraging the establishment of tumor registries, supporting pathology and radiology seminars and publishing data regarding the diagnosis and treatment of cancer. It has also helped to support a Tumor Tissue Registry.

The Commission has been helped in its studies of unorthodox methods of treating cancer by the Bureau of Investigation of the American Medical Association, the Food and Drug Administration, and the Committee on Cancer Diagnosis and Therapy of the National Research Council.

Three alleged cancer treatments have been studied by the Commission since 1952 and the results of these studies were published in *California Medicine* [7]. The Commission publishes a pamphlet entitled "Unconventional Cancer Treatment Methods" for the medical profession. Numerous unorthodox methods of treatment are listed as well as references for obtaining more detailed information. Other publications by the Commission are "Cancer Detection Examinations" and "Cancer Committee of the County Medical Society."

STANDARDS FOR INVESTIGATION

In the evaluation of any method of treatment one must be absolutely sure that the patient had cancer in the first place. One must also be certain of the safety and sterility of the preparations to be used.

The procedure which has been used by the Commission when a complaint is received from physicians and patients and a decision is made to open an investigation has been as follows: (1) obtain data regarding the nature of the treatment used; (2) personally interview, if possible, the advocates of the method and ascertain their educational background; (3) study any experimental evidence presented by the advocates of the treatment method; (4) study any clinical evidence presented; (5) obtain any autopsy data for analysis; (6) obtain some of the alleged remedy for use by independent investigators (difficulty will usually be experienced in obtaining any of the remedy); (7) make a clinical study of patients under carefully controlled conditions by investigators using the remedy with the sanction of the Commission (the only patients used in such a study are those with far advanced lesions and for whom orthodox methods have been tried); (8) should any of the patients who are receiving the remedy as a part of the Commission's clinical study die, attempts are made to obtain an autopsy in order that any effect upon the tumor cells may be detected; and (9) consultation is requested with especially qualified scientists and institutions in order that a fair appraisal may be made. At the conclusion of the study the evidence and final analysis is published in a medical journal for the benefit of the medical profession. The advocate of any new experimental treatment or procedure should be responsible for presenting satisfactory evidence that his treatment method has possible value in the treatment of cancer.

The Commission is also one of the co-sponsors (along with the American Cancer Society, California Division, and the Food and Drug Administration) of the excellent State Department of Public Health "Cancer Quack" exhibit. This exhibit includes secret remedies, secret machines and cancer salves, and it is most effective in discouraging the public from seeking help from untrained, unethical people.

NEED FOR LEGISLATION

A legislative program is necessary to prevent the exploitation of the public by unethical individuals using worthless remedies and machines in the diagnosis and treatment of malignant disease.

Effective means must be found to properly investigate claims which are made for the diagnosis and cure of cancer when no scientific evidence has been presented.

The public must be kept informed of the progress being made in the diagnosis and treatment of cancer and quacks must be exposed. Many people still have inadequate information as to how cancer is properly diagnosed and treated.

Educational programs must be instituted to counteract the claims of well meaning, misguided people who make speeches and write magazine articles which protect the dishonest, selfish, deceitful users of unorthodox methods.

The continued increase in the population of this state, particularly in the older age groups, is certainly indicative that the cancer problem will be multiplied in the future.

Until the Pure Food and Drug Act became a law in 1907, the dispensers of all types of pills, oils, powders, bitters, and herbs with extravagant claims for their merchandise were under practically no control. As a result of the law, certain restrictions had to be complied with on the labels of the material to be sold. Much of the popularity of some of the patent medicines resulted from the effects of their alcohol content. Many so-called teetotallers and workers for temperance groups took this "medicine." In September, 1905, Edward Bok, publisher of *The Ladies Home Journal*, published a story with pictures concerning a "scientific experiment" to compare three different patent medicines and one beer to show their alcoholic content. According to a chart accompanying the pictures the results were as follows: Hostetter's Celebrated Stomach Bitters contained the greatest percentage of alcohol. Peruna was second, Lydia E. Pinkham's Vegetable Compound was third, and the standard lager beer was a poor fourth [*8*].

One of the major difficulties which handicaps the work of the Food and Drug Administration is that the jurisdiction of the agency is confined to products, methods, or devices used in interstate commerce.

THE CANCER BILL FOR CALIFORNIA

The present Cancer Bill (Senate Bill No. 194) which was adopted by the Legislature in 1959 and which became effective September 18, 1959 created a Cancer Advisory Council. This bill was arrived at after numerous revisions and after discussion and consultation with many groups and individuals.

The Commission on Cancer of the California Medical Association, along with the American Cancer Society, the California Osteopathic Association and many other organizations, was active in helping to secure passage of this legislation.

Some of the objections raised against the passage of a cancer bill were that it "hinders sincere scientific heretics," it interferes with "basic scientific research," present laws are sufficient to curb quacks, "freedom of choice in matters of health goes out the window," "The Board of Medical Examiners can do the job," the "unorthodoxy is the doing of that which is new," and "so-called orthodox medicine has no more, if as much, to offer the cancer victims as the nonmedical healer."

The Cancer Advisory Council is a part of the State Department of Public Health. It is composed of nine physicians and surgeons practicing in the state, three persons who are not physicians and surgeons, two persons representing nonprofit cancer research institutes recognized by the National Cancer Institute, and the Director of the State Department of Public Health, who shall be an ex officio member. At least one member is appointed by the Governor from the faculty of each of the medical schools located in this State that are approved by the State Board of Medical Examiners and/or the State Board of Osteopathic Examiners.

It will be most interesting to see how effective this legislation will be in helping to control cancer quackery in California. If it proves to be successful, other states will surely enact similar legislation.

The Council is at the present time in the process of setting forth the regulations under which it is going to accomplish the investigation and testing authorized by the legislation. The laboratories of the State Department of Public Health, laboratories and scientists in medical schools, and national and other nonprofit research institutes will be utilized in the testing.

A few people continually state that the medical trust is suppressing competition or attempting to intimidate research. It is inconceivable that the members of the Cancer Advisory Council would prevent the use of any agent or procedure helpful in the treatment of cancer. A quotation from an editorial in *California Medicine* regarding the Commission on Cancer is applicable. It is quoted as follows: " . . . any mind that gives any place at all to faith, it is inconceivable that men of such stamp would not welcome and shout about a cure for cancer, whether it should be found by painstaking research in a great medical center, by accident in a high school physics class, or by mumbo-jumbo with burned feathers and crushed spiders in a mud hut in Borneo. And even those few unhappy cynics who are so forlorn that they can put no faith in honor as a motive, must know that to conceal a cure for cancer would be quite impossible no matter who might wish to do so!" Also, on commenting on medical progress, Hench [9] makes these observations which are pertinent to the present subject, "There seems to be no special 'climate' for medical discovery: great discoveries have been made almost anywhere and everywhere. No desolate military outpost is too small and disorganized, no research center too large and too organized, to prevent them. Wherever there is a physician, in that place are the potentials for discovery of new medical truths. To be useful, however, medical truth must be put to work, it must serve. In the last analysis, that can happen only when the informed, dedicated physician and a single patient who needs him actually meet. It is in this place, a sick room, where the truthful meaning of the theorists, the demonstrations of the experimentalists, the magic of the chemists, the guidance of the laboratory, and the wisdom of the practitioner come together for the final testing."

THE PHYSICIAN'S RESPONSIBILITY

Some of the obligations which the physician assumes when he treats a patient with cancer are the following:

1. The maintenance of morale in the patient and the family is vital. Avoid at all costs giving the patient the idea that nothing further can be done to check the course of his disease. Always hold out, in some manner, but honestly so, a hope to which the patient can cling that something of value can be done. Such assurance may aid in making his terminal illness a meaningful and bearable experience instead of one of terror and abandonment. Let the patient be as active as he desires and actively encourage him to continue his normal pursuits as much as it is possible. Never hesitate to suggest the possibility of consultation.

2. Never, under any condition, abandon the patient. When the doctor gives no hope, the patient gives up hope. There is always some quack waiting nearby to take over when the physician gives up hope.

3. Make the prognosis clear to some responsible member of the family.

4. Use any available, effective method to slow the progress of the disease as much as possible.

5. Keep the patient as free of discomfort as possible through the use of mild narcotics, stimulants and drugs which produce euphoria.

6. Explain the problem of cancer quackery to the patient and the family.

It is incumbent upon every physician to give the patient afflicted with cancer the best possible medical care and advice. The physician should always be a leader in the education of the public with regard to proven methods of therapy.

Adequate legislation and thorough investigation of the dishonest advocates of worthless remedies and the continuing education of both the medical profession and of the laity should do much to discourage quackery until the cause and cure for cancer is found.

REFERENCES

1. Jeaffreson, J. D. A Book About Doctors, vol. 1, p. 98. London, 1860. Hurst and Blackett.
2. A background report on cancer quackery. New York, 1957. American Cancer Society.
3. Garland, L. H. The pursuit of the unorthodox. *J. Michigan M. Soc.*, 57: 525, 1955.
4. Cameron, C. S. Beware the cancer quack. In: Cancer News, p. 3. New York, 1955. American Cancer Society.
5. Cameron, C. S. Beware the cancer quack. In: Cancer News, p. 5. New York, 1955. American Cancer Society.
6. Final Report to the Sponsors. Committee on Cancer Diagnosis, and Therapy, Division of Medical Sciences, National Academy of Sciences—National Research Council, p. 23, 1957.
7. Garland, L. H. Cancer quacks; their menace and what is being done about it. *The A. C. S. Volunteer*, p. 8, 1955.
8. Holbrook, S. H. The Golden Age of Quackery, p. 98. New York, 1959. The Macmillan Co.
9. Hench, P. Cited in: A Pictorial History of Medicine, p. 9. Bettman, O. L. Springfield, Ill., 1956. Charles C Thomas.

Geriatric Patients with Head and Neck Problems

OLIVER H. BEAHRS, M.D., *Rochester, Minnesota*

From the Mayo Clinic and Mayo Foundation, Rochester, Minnesota.

LESIONS of the head and neck occur in patients of all ages. However, the types of lesions vary from one age group to another. Congenital or developmental lesions are usually seen in the younger patients while tumors occur more frequently in the older ones. This is only a general statement, for carcinoma of the parotid and tumors of the thyroid are seen in children and a thyroglossal cyst or a cystadenoma lymphomatosum (Warthin's tumor) can make its first appearance in a patient seventy-four years of age.

All ulcerations or swellings of the neck (soft or hard, painful or painless, recent or of long duration) are potentially dangerous to the patient unless proved otherwise. Therefore, they should be examined. Physical examination may occasionally disclose that the tumor is obviously benign (a lipoma or keratoma, for instance) and an experienced surgeon may then elect simply to keep the patient under periodic observation. He is justified in doing so only in such a circumstance as this.

DIAGNOSIS AND EVALUATION

Clinical Examination. The history of the presence of some lesions may be misleading. Because of this, analysis of the microscopic section is much more significant than analysis of the spoken word. A goiter may have been present for many years without significant change, yet metastasis may have occurred from a carcinoma of the thyroid. A lump in the side of the neck may be said to be decreasing in size but may prove to be secondary to a carcinoma of the larynx. At times, however, a history may be of great significance in evaluating the condition. A parotid tumor may have been present for twenty to thirty years without any significant change except that it began to increase in size three to six months prior to examination. Such a history is almost diagnostic of a mixed tumor of the parotid which is undergoing malignant transformation.

Whenever an abnormality is noted in the region of the head and neck, thorough and extensive examination of the region is extremely important. A lump in the neck should not be considered a swollen gland and hoarseness should not be considered the result of a sore throat. A careful history should be obtained and evaluated. Both sides of the neck should always be examined because a lesion can sometimes be identified only by asymmetry. A cylindroma of the parotid is frequently ill-defined and it is only by bilateral palpation that the examiner can identify the presence of a lesion on the one side. Every examination, especially when a tumor is present in the neck, should include careful inspection of the lips, all parts of the mouth and pharynx, and indirect laryngoscopic inspection of the larynx. A carcinoma of the thyroid is often the source of a tumor in the cervical region. Therefore, the thyroid gland always should be carefully palpated. The fact that a tumor in the neck might be a result of generalized disease or be secondary to tumors below the level of the clavicle must be kept in mind. A general examination is necessary as part of the evaluation of lesions of the head and neck because of these possibilities.

Consideration of Treatment. The general examination also establishes the general condition of the patient and his physiologic age which is of greater importance than his chronologic age. Advanced chronologic age, alone, should not be a deterrent to advising radical surgery. Each patient must be evaluated as an operative risk entirely on his own status. Actually, the fact that he has lived to a great age supports the judgment that he has a strong constitution. Those with weak constitutions do not survive to advanced ages. Physiologic

age is determined chiefly by evaluation of the cardiovascular, renal, and central nervous systems. If there is no indication of degenerative disease of these systems, the risk of major surgery should not be greater than it is in some persons who are chronologically younger.

Radical surgical procedures such as combined hemiglossectomy, hemimandibulectomy, and radical neck dissection in continuity are necessary for some malignant diseases of the head or neck. Even though these procedures are extensive, they have proved to be less conducive to shock than procedures requiring opening of a body cavity and they carry a low mortality.

The mortality for thyroidectomy at the Mayo Clinic for all age groups and for all histopathologic types was 0.1 per cent in 9,000 cases from 1946 through 1955. There was no hospital mortality among 760 patients who underwent parotid operations from 1945 to 1954. For carcinoma of the tongue treated in single and multiple stages, the mortality has been 3.6 per cent. For radical neck dissection alone, the rate is approximately 1 per cent. There has been no mortality in excision of benign lesions. Among 500 patients from whom tissue was removed from the neck for diagnosis, there was no death and practically no morbidity.

The patient's advanced age has frequently led a surgeon to choose a less radical procedure than he otherwise would and the treatment has been inadequate. Fear of cosmetic defects resulting from radical surgery about the head and neck in a patient of any age has often resulted in a surgical procedure which was too conservative. Inadequate or conservative surgical treatment is largely responsible for the high rate of recurrence and low rates of survival among patients with these lesions. Life is precious to each person regardless of age and deformity. As long as the defect is compatible with essentially normal living, definitive surgery should always be performed if possible. If a lesion is inoperable, the surgeon should not proceed with treatment and should realize that it will not be helpful and may possibly be harmful. Radiation therapy may be of value in many of these cases.

From the foregoing comments it should be obvious that any patient with a lesion about the head and neck should be carefully examined and adequately treated regardless of age. The therapeutic goal should be to prevent illness when possible, to cure illness if that can be done, and to assure such comfort as is possible by performing the right procedure if it is impossible to cure. The decision to perform an operation is based on the judgment that the benefits the patient can expect from it outweigh the risk and discomforts involved. The decision will always be an estimate rather than a conclusion based on exact measurements and it will always be compounded of common sense and experience mixed with science.

PREPARATORY AND SUPPORTIVE MEASURES

After the clinical diagnosis has been made and the course of treatment has been decided upon, it becomes the responsibility of the surgeon to discuss frankly with the patient and relatives the probable diagnosis, the surgical procedure that may be needed, and the cosmetic and functional results that may be expected. If a patient knows that the lesion is probably cancerous, he can adjust to the necessity of the treatment and accept the cosmetic and functional results with less difficulty. If a tracheotomy will be needed temporarily after operation, the patient should be so informed. Any well-informed patient is always a better patient.

Any preoperative supportive therapy or treatment of a coexistent disease that is indicated should be given. Dehydration and anemia may occasionally be present in an older patient with carcinoma of the mouth, and these conditions must be corrected.

Preoperative sedation should be adequate, but excessive sedation should be avoided in older patients. A general anesthetic is usually used since it provides better control of the patient and a greater latitude for the surgical procedure that may be necessary. Pathologic interpretation by fresh frozen technic should be available if the lesion being operated upon is undiagnosed preoperatively. I prefer not to depend on needle biopsy but to do an excisional biopsy and be prepared to extend the surgery as indicated. If the diagnosis has been established as carcinoma by biopsy of an intra-oral lesion and a tumor is present in the side of the neck, I proceed with radical neck dissection without biopsy of the neck lesion.

Consideration must be given to blood loss

during the operation, but overreplacement should be guarded against.

A tracheotomy should be established when necessary. Obstruction of the airway is to be guarded against. Edema frequently develops in remaining structures after major operations on the neck and occasionally compromises the airway. Older patients experience difficulty in raising secretions. A tracheotomy assures an adequate airway during the period of edema and permits easy aspiration of secretions during the immediate postoperative period.

Early ambulation is encouraged for many obvious reasons, especially for older patients. It usually is possible since there is no abdominal incision and the presence of shock is rare. Many of the patients are given prophylactic anticoagulant therapy. Early in our experience several patients died of pulmonary embolism, but we have had no further trouble with thrombophlebitis since using anticoagulants. If an intra-oral procedure has been performed, feeding is accomplished through an indwelling intranasal gastric tube. Otherwise, oral intake is started the day following operation.

PRIMARY THERAPY

Early diagnosis is essential if good results are to be obtained from treatment. An ulcer or abnormal swelling about the head and neck should not remain undiagnosed once it is known to be present. Benign lesions that are occasionally seen in older patients include congenital branchiogenous and thyroglossal cysts and fistulas, lipomas, myxomas, fibromas, myomas, chondromas, neurogenic tumors, diverticula, laryngoceles, epidermal and sebaceous cysts, and adenitis of Boeck's sarcoidosis. These lesions usually can be excised without difficulty and do not require extended surgical procedures when proved benign. However, thyroglossal cysts must be removed by means of a Sistrunk operation in which the midportion of the hyoid bone is excised along with a tunnel of tissue in the direction of the foramen cecum of the tongue if recurrences are to be prevented. Some neurogenous tumors, such as chemodectoma (tumor of the carotid body), are very difficult to remove because of their close anatomic relationship to the carotid arteries. However, they almost always can be excised by careful dissection without injury to the vessels. Neurofibromas sometimes are close to the base of the skull and require fairly wide incision and exposure if they are to be removed safely. Difficulty is rarely experienced in removal of the other lesions mentioned.

Parotid Tumors. Tumors of the parotid are seen in the preauricular and infra-auricular regions. Approximately 30 per cent of patients having these lesions are past sixty years of age. Fortunately, 80 per cent of the tumors are benign and the majority of these are of the mixed-tumor type. Next most frequent is cystadenoma lymphomatosum (Warthin's tumor), which occurs more commonly in men and is typically situated just below the ear at the posterior border of the gland.

The most common malignant tumor is the mixed tumor that has undergone malignant transformation. Patients with these lesions usually give a history of having had a tumor in front of the ear for twenty to thirty years, even fifty years in some instances, without significant change in size until it suddenly began to grow about six months before advice was sought. On the average, patients with these tumors are about ten years older than patients with benign mixed tumors. Histologic study shows regions of benign and malignant tissues as well as mixture of the two.

Other malignant parotid tumors include cylindromas (adenoid cystic carcinomas), mucoepidermoid carcinomas, adenocarcinomas, and metastatic lesions of the parotid lymph nodes. Malignant lesions are less definable by palpation; in approximately 25 per cent of instances they will have caused pain or facial paralysis or both by the time the patient is first seen for examination.

Benign parotid tumors are best treated by parotidectomy with preservation of the facial nerve. Subtotal parotidectomy is performed when the lesion is in the portion of the gland superficial to the facial nerve, and total parotidectomy is used when it is in the part of the gland deep to the nerve. Since adopting this plan for the management of mixed tumors, there have been no recurrences of tumor among more than 100 patients who were given primary treatment. Earlier, when these lesions were locally excised or enucleated, the recurrence rate in reported series varied from 20 to 40 per cent. Warthin's tumors frequently occur at the capsule of the gland and can be excised satisfactorily without parotidectomy when in this location.

For highly malignant lesions of the parotid it

is essential that total radical parotidectomy be performed with sacrifice of the facial nerve and any adjacent tissue as necessary to obtain a satisfactory margin around the lesion. For certain tumors of moderate degrees of malignancy, such as mucoepidermoid carcinoma, all or a portion of the facial nerve might be preserved if the tumor is small and is some distance from the nerve or its branches.

Radical dissection of the neck is done when nodes clinically seem probably or definitely involved but distant metastasis has not been found. In the absence of lymphadenopathy, neck dissection usually is not performed.

The five-year survival rate of patients with highly malignant parotid tumors is 38 per cent, while it has been 85 per cent for those with tumors of moderate degrees of malignancy. Earlier and more radical treatment may improve these results.

When the facial nerve has been sacrificed, I have often inserted a free nerve graft to bridge the gap between the main trunk and the peripheral branches of the nerve. Sufficient return of function has occurred to mask the facial paralysis in approximately 70 per cent of these cases.

Parotidectomy is being employed now for chronic sialadenitis and calculus of the parotid duct. The results have been excellent.

Thyroid Tumors. Tumors of the thyroid are seen frequently in persons in the middle and older age groups. It has been reported that more than 50 per cent of the older people have nodular goiters. There is some choice whether or not a goiter should be removed. If a small, soft, multinodular goiter has not changed although it has been known to be present for ten to twenty years or more in a patient sixty years of age or older, further observation might well be justified. On the other hand, thyroidectomy is indicated if a goiter is of recent origin and composed of a single nodule which is thought to be increasing in size and is rather firm on palpation. Three potential hazards must be considered in deciding whether or not surgery should be advised: carcinoma, hyperthyroidism, and pressure on the airway and vessels in the thoracic inlet. Carcinoma is seen in 7.5 per cent of surgical specimens removed from patients with goiter at the Mayo Clinic. Malignancy has been found in 3.8 per cent of asymptomatic goiters not suspected of being carcinomatous. It has been estimated that 10 to 20 per cent of multiple adenomatous goiters will cause hyperthyroidism if not removed. Too frequently an older patient comes to the hospital in cardiac decompensation, with fibrillation and weight loss. This situation could have been prevented had the goiter been removed years before.

Exophthalmic goiter in patients past forty to forty-five years of age is being treated almost exclusively with radioactive iodine. Most other goiters are best treated surgically except thyroiditis, which may be treated medically if the diagnosis can be established by laboratory means and needle biopsy.

Benign adenomatous and other nodular goiters are treated by a bilateral subtotal lobectomy with removal of the isthmus; 2 to 4 gm. of tissue is usually preserved on either side of the trachea. This remnant is usually sufficient to prevent myxedema, and the parathyroid glands and the recurrent laryngeal nerves are safer without total thyroidectomy.

Approximately 70 per cent of all malignant lesions of the thyroid are papillary carcinomas. Fortunately this lesion grows slowly; my experience has been that it can be cured by conservative surgical measures even though it spreads to the regional lymph nodes in 50 per cent of cases. Some surgeons believe that radical surgery must be performed. I usually perform a total lobectomy on the side of the lesion and a subtotal lobectomy on the opposite side. About 10 to 20 per cent of the lesions in the thyroid are multicentric. If metastasis is thought to be present from clinical examination or on palpation of the lymph-bearing tissue at the time of operation, exploration is extended into the lateral portion of the neck and a modified neck dissection is usually performed with removal of the tissues in which nodal involvement is suspected. A radical neck dissection is performed only if there is extensive involvement of the jugular chain of nodes. Among 136 patients with papillary carcinoma seen and treated in this way from 1938 through 1947, 97 per cent have survived for five years, 89 per cent for ten years, and 75 per cent for fifteen years.

Other types of carcinoma of the thyroid are usually treated by total thyroidectomy when possible. Unfortunately, many of the anaplastic carcinomas are inoperable when first seen and the results in these cases are uniformly poor. The results of treatment of solid carci-

noma with amyloid stroma, a moderately malignant tumor, are better. Approximately 60 per cent survive for five years.

Other Tumors. Carcinoma of the lip is seen most frequently in men of the older age groups and may be treated effectively by either surgical excision or radiation therapy. I favor the former method of treatment and the results have been uniformly good. These lesions spread rather regularly to the submaxillary lymph nodes in less than 10 per cent of the cases. Since the spread is rather infrequent and orderly and moves to an easily palpated group of nodes, neck dissection is not performed routinely unless metastasis is thought to be present.

Intra-oral carcinomas on the tongue, floor of the mouth, gingiva, and tonsil are best treated by wide excision with sacrifice of the hemiglossus, the hemimandible, or other structures as necessary to remove a satisfactory margin about the lesion. Lesions of the posterior pharynx, nasopharynx, and occasionally the base of the tongue are best treated by radiation therapy since wide resection is not easy in these cases. Intrinsic cancers in the larynx can be treated satisfactorily by radiation therapy; extrinsic cancers are best managed, as a rule, by laryngectomy. Intrinsic laryngeal lesions rarely produce metastasis; therefore, a neck dissection is rarely indicated. For the other intra-oral lesions mentioned it can be said, in general, that there will be clinical metastasis when the patient is first seen in approximately a third of the cases and that metastasis will be found in another third of the cases on histologic study of the tissue removed at radical neck dissection. The spread from these lesions is not orderly as is that from carcinoma of the lip. They more often involve the deeper nodes of the neck which are difficult to palpate early in the involvement. Since the incidence of nodal metastasis is relatively high in these cases, I usually recommend that radical neck dissection be performed on the side of the lesion at the time that the primary lesion is treated. An exception to this rule would be made when the primary lesion is small, low in grade of malignancy, and situated on the anterior third of the tongue.

Treatment of these variously situated lesions has resulted in the following five-year survival rates: tongue, 40 per cent; floor of the mouth, 46 per cent; gingiva, 52 per cent; intrinsic larynx when conservative treatment is feasible, 87 per cent and when laryngectomy is necessary, 68 per cent; and extrinsic laryngeal lesions, 35 per cent.

SUMMARY

All lesions of the head and neck (including the parotid gland, oral cavity, larynx, thyroid, and lateral portions of the neck) call for excisional biopsy at the least. The operative procedure should be extended as indicated after the type of lesion has been established. The age of the patient, even though he is in an older age group, is not a deterrent to definitive surgery. Surgical procedures on the head and neck, even though radical, are well tolerated by older persons. The mortality for these operations is very low and morbidity is minimal. Results of treatment of carcinoma of the head or neck are good. Earlier treatment and more adequate surgical procedures should improve these results in the future.

Implant Reconstruction of the Orbit

B. E. Bromberg, M.D., D.D.S., L. R. Rubin, M.D., and R. H. Walden, M.D., D.D.S., *New York, New York*

We have strongly advocated the use of polyethylene in facial reconstructive surgery since 1948. In 1955 Rubin and Walden presented an evaluation of our results covering seven years which was subsequently published in *Plastic and Reconstructive Surgery*. The advantages of polyethylene were pointed out in that paper and for the sake of emphasis are repeated again:

1. It can be carved to accurately reproduce the anatomic structure desired with an attention to detail far surpassing that obtainable with either human bone or cartilage.

2. Its use markedly reduces the operating and anesthesia time as it may be entirely prepared prior to surgery thus eliminating the need for extended surgery to procure the cartilage or bone replacement from the patient.

3. The possibility of warping, breaking, and dissolving of the "feathering" at the edges is eliminated. In addition, there is no alteration in size after the insertion of the implant.

4. Defects of unlimited size or myriad shapes can easily be replaced by this synthetic in marked contrast to the limitations of bone or cartilage.

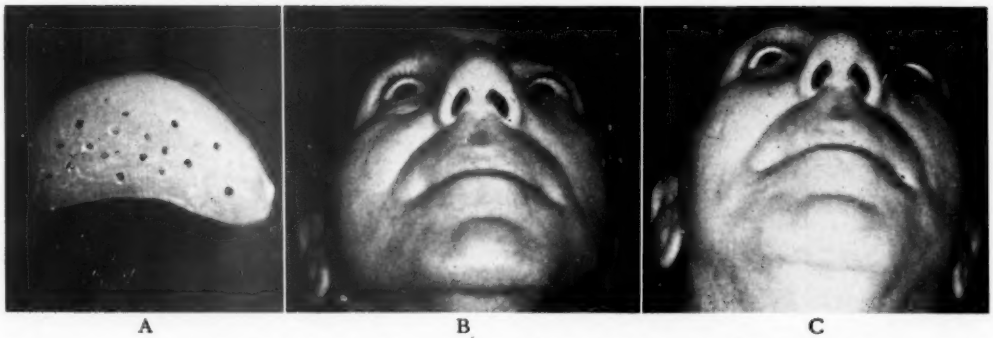
It is not the purpose of this report to champion the cause of a synthetic material which now has withstood the test of time, but rather to offer a technic that we have developed for its use in a specific area of the face. Twenty-four implants have been utilized in the orbital and periorbital areas of sixteen patients during the last ten years without the loss of a single replacement.

The primary indications for replacement in the orbital and malar area are deformity and diplopia.

For the most part, deformity and diplopia result from complications of fractures involving the orbital bones. In other instances deformities are congenital or result from inflammatory reactions or modalities of treatment, such as destruction of bone subsequent to radiation therapy of tumors in early years.

Certainly the improvement in the treatment of fractures of the zygoma and malar compound has reduced markedly the number of deformities residual in this area. In 1956, we reported over 1,000 fractures of which 109 were malar compound fractures and fractures of the zygomatic arch. Of the total series (1,305) there were only thirty-two residual deformities severe enough to necessitate secondary reconstructive procedures.

Transient diplopia is common in simple malar compound fractures and will usually disappear even if no treatment of the fracture is undertaken. This transient diplopia has been accurately described by Barclay [6] and apparently results from reflex inhibition or damage to the inferior oblique muscle of the eye on the injured side. Persistent diplopia is seen more often in the severe type of comminuted injury although the "blowout" injury, in which the orbital floor is independently damaged, as described by Converse and Smith [8], can be associated with this complication as well as enophthalmos. Barclay suggests that persistent diplopia is due, in the majority of cases, to fibrosis and adhesions in the region of the inferior rectus and inferior oblique muscles which prevents free rotation of the eyeball. In addition, residual deformity of the orbital floor as a result of severe comminution or inaccurate restoration does not permit these muscles to function at their optimum lengths. It is believed that the improvement in vision after an orbital floor implant is due to release of adhesions and the prevention of subsequent adhesions as a result of the smooth surfaces. The floor implant also improves the muscular efficiency by permitting the muscles to more nearly approximate their optimum



A B C

FIG. 1. A, typical polyethylene implant used for malar area; note holes for ingrowth of fibrous tissue. B, preoperative view showing right malar depression following facial trauma. C, postoperative view showing correction of right malar depression with a polyethylene implant.

operating length. Pelzer [3] suggests that definitive measurement of eye muscle function should be performed before the emergency surgery and after reasonable reduction of the fracture.

Enophthalmos is a more frequent complication than persistent diplopia in malar compound fractures and apparently is a result of the immediate loss of orbital fat and its subsequent slow absorption. The correction is never attained by orbital floor implants and one must disappointingly resort to dermal implants for the lids or, as Spaeth [9] recommends, fascia lata plugs to the retro-ocular space.

It was necessary to restore the orbital floor as well as the infraorbital or malar region in seven of our cases. The lateral orbital region must also be restored to contour in many instances and this is accomplished with great difficulty when bone or cartilage is used, for the curve from the lateral to the infraorbital area exists in two different planes.

The use of an implant as an emergency procedure as described by Converse and Smith has merit but would be extremely limited in its application. Occasionally, postoperative diplopia is absent despite severe comminution of the orbital floor with complete destruction, particularly when the orbital contents have been quickly and adequately maintained by antral packing. Sufficient fibrosis apparently occurs to maintain a close anatomic resemblance to the previous normal situation with little alteration of the extrinsic muscle balance. In the majority of severe malar compound injuries, there are frequently severe injuries of the skull and long bones, and one is not justified in further jeopardizing the patient by the additional surgery that would be required at the time of the initial trauma.

TECHNIC

The residual deformity must be minutely evaluated and clinical comparison and measurement made with the normal side. Position of any scars, comparison of globe levels, bony irregularities, enophthalmos and degree of diplopia must be noted. When diplopia is present, it is most essential for the ophthalmologist to examine and note the degree of deficiency and the fields involved.

Specific roentgenograms and an accurate face mask are essential for the basis of an accurate implant. Six foot Buckey views in the Waters and lateral orbital position are best, and several Waters positions are obtained altering the angle slightly in each radiograph. One can then accurately pencil out the orbital floor deformity on tracing paper placed over the roentgenograms on an x-ray viewer both in the anteroposterior and lateral projection. The dimensions of the floor implant can accurately be determined in this maneuver, and it is of particular significance in establishing the width and posterior extent. The thickness can also be established in this manner; however, one should place equal emphasis on clinical impression and measurement and on the face mask in this particular dimension. The floor implant is usually ground to dimension although one could readily develop the implant in wax and subsequently cast it. The dimensions are invariably made slightly larger so that any

FIG. 2. A, severe facial trauma typical of injury in car accident. B, residual deformity with marked depression of the right orbital floor and right malar area; patient has diplopia. C, deformity markedly improved following malar and floor implant; diplopia corrected.

inaccuracies can easily be corrected in the operating room.

The face mask is prepared several weeks prior to surgery, and it must be a complete mask. It should include the entire frontal area and extend to the chin. In addition, it should reach the line of the tragus on both sides in its posterior extent.

The malar deformity, and its extension to the lateral orbit if necessary, are then developed in wax to match the normal side. The implants are then carved or cast as desired.

Multiple large holes are placed to allow the ingrowth of fibrous tissue and the surfaces are left rough for better adherence to the tissue. (Fig. 1A.)

The implants are boiled for a minimum of 20 minutes and then transferred to sterile jars containing 70 per cent alcohol. They are placed into metal beakers containing aqueous Zephiran® prior to use.

Minor adjustments in size and contour may be made in the operating room using a knife or dental stones and burrs.

The incisions to be made should be determined on the basis of previous scars in the area and in most instances will be lateral or infraorbital. The pocket of the orbital floor is gently developed and in most instances has sufficient immobility as to require no fixation. When, however, a floor and malar implant is inserted, the two implants are wired together at the infraorbital rim margin after securing the malar implant through four holes drilled into the bony infraorbital margin. No. 25 or No. 26 wire is used and one of the previously placed holes in the implant is employed to gain purchase. If this is not available at the desired point, a needle with a cutting edge easily pierces the implant. A double layered closure is essential and a mild immobilization type of dressing is placed.

REVIEW OF CASES

During the last ten years, sixteen patients were operated on and twenty-four implants were inserted as indicated in Table 1. (Fig. 1B and C.) Seven patients received both orbital floor and malar implants at the same procedure. (Figs. 2A, B and C.) Two of these patients had supraorbital implants of polyethylene in addition. Four of the malar implants extended laterally to include the lateral orbital area. (Figs. 3A, B, C, D and E.)

TABLE 1
TOTAL NUMBER OF IMPLANTS

Orbital floor	11
Supra-orbital	2
Malar and/or lateral malar	11
Total implants	24
Total patients	16

FIG. 3. A, severe facial trauma with partial avulsion of left malar and orbital areas. B, immediate postoperative repair with residual deformity of left orbital and malar areas. C, lateral view showing marked depression of the left malar area. D, view showing postoperative elevation of malar depression with polyethylene. E, postoperative views showing elevation of left orbit with polyethylene.

Automobile accidents were the major form of trauma and accounted for eight of the most severe injuries. (Table II.) In the majority of automobile accidents there were other associated severe fractures of the face, skull, and long bones. Falls and blows resulted in an additional three cases. Two cases were congenital in origin and two were deformities subsequent to inflammatory conditions affecting the bone. A deformity developed in one patient after the use of radium in the treatment of a soft tissue tumor in the malar area. In five patients who were in automobile accidents persistent diplopia developed subsequent to their injury and all had associated moderate to severe enophthalmos. (Table III.)

In no case was the enophthalmos improved after surgery although the diplopia was mark-

TABLE II
CAUSES OF INJURY

Automobile accidents	8
Blows or falls	3
Congenital	2
Postinflammatory	2
Postradiation therapy	1
Total	16

TABLE III
EYE COMPLICATIONS

Persistent diplopia	6
Loss of vision	2
Moderate to severe enophthalmos	8

TABLE IV
RESULTS AFTER SURGERY

Cosmetic	Excellent in sixteen cases without loss or subsequent alteration of an implant
Diplopia	Markedly improved in four cases and completely relieved in two cases
Enophthalmos	Unaltered in all eight cases

edly improved as a result of the floor implant in three cases and completely obliterated in two cases. Persistent diplopia developed in one patient who suffered a blow from a tire rim. It improved markedly after surgery. Moderate enophthalmos developed in another patient due to a blow, but diplopia did not occur. Two patients who were in automobile accidents had complete loss of vision in the involved eye and an enucleation was ultimately performed on one of these patients. In all instances the cosmetic result (Table IV) was excellent and none of the implants has ever been removed or subsequently revised.

The time interval from the day of injury to the reconstruction surgery ranged from six months to five years in the cases of trauma. The orbital floor implant was placed in one patient, during the primary repair of the fracture which had occurred forty-eight hours before surgery.

Diplopia and enophthalmos were not seen when the cause was congenital or inflammatory and, in most instances, these cases were corrected by malar area implants. For the most part, they were restored many years later althought it would appear that repeated implants could be inserted during growth years and be replaced as the bony configuration enlarged.

Although the selection of an implant material must be on an individual basis whether autogenous, homogenous or synthetic, one cannot remain oblivious to the outstanding properties of polyethylene properly used. As in all candidates for this type of surgery, certain fundamental requirements must be met. The success of all implants, whether autogenous, homogenous or synthetic, hinges upon the overlying skin and subcutaneous tissue. The procedure must be meticulously planned and the implants should be fixed in most instances. Mobility and inaccurate contouring of the implant along with poor skin coverage and residual inflammatory reaction in the host site are the most significant causes of failure. The successful use of polyethylene implants in the orbital and periorbital area is striking and, although the technic presented offers no essentially new devices, it has been presented as a basis for continued good results.

REFERENCES

1. RUBIN, L. R. and WALDEN, R. H. A seven year evaluation of polyethylene in facial reconstruction surgery. *Plast. & Reconstruct. Surg.*, 16: 392, 1955.
2. CONVERSE, J. M. Restoration of facial contour by bone grafts introduced through the oral cavity. *Plast. & Reconstruct. Surg.*, 6: 295, 1950.
3. PELZER, R. H. and GARVIN, W. J. Controlled correction of diplopia and eye muscle imbalance in orbital and zygomatic fractures. *Am. J. Surg.*, 96: 735, 1958.
4. RUBIN, L. R., ROBERTSON, G. W. and SHAPIRO, R. W. Polyethylene in reconstructive surgery. *Plast. & Reconstruct. Surg.*, 3: 586, 1948.
5. CONVERSE, J. M. Technique of bone grafting for contour restoration of the face. *Plast. & Reconstruct. Surg.*, 14: 332, 1954.
6. BARCLAY, T. L. Diplopia in association with fractures involving the zygomatic bone. *Brit. J. Plast. Surg.*, 19: 236, 1957.
7. MCCOY, F. J. Management of the orbit in facial fractures. *Plast. & Reconstruct. Surg.*, 19: 236, 1957.
8. CONVERSE, J. M. and SMITH, B. Enophthalmos and diplopia in fractures of the orbital floor. *Brit. J. Plast. Surg.*, 9: 265, 1957.
9. SPAETH, E. B. Correction of diplopia after fractures of orbit. *Tr. Am. Acad. Opbtb.*, 57: 883, 1953.
10. WALDEN, R. H. and BROMBERG, B. E. Recent advances in therapy of maxillofacial bony injuries in over 1,000 cases. *Am. J. Surg.*, 93: 508, 1957.

Surgical Reconstruction of the Middle Ear

GLENN J. GREENWOOD, D.D.S., M.D., *Los Angeles, California*

SOME 260 million years ago, our ancestors were forced to leave the sea for survival [1]. They emerged with a fluid-functioning ear mechanism used primarily for equilibrium which was probably initially salty and also probably responsive to other coarse vibratory stimuli which were interpreted as sound. It had taken approximately 260 million years to perfect this alerting, peripheral balancing, coarsely acoustic, marine apparatus [2]. Having consumed all this time perfecting this physiologic apparatus, evolutionary forces were not sufficiently "politically" minded to discard it.

The problem of having to adapt this marine ear to its new terrestrial, atmospheric environment was accomplished by salvaging a portion of the now obsolete branchial mechanism. So, the first branchial groove invaginated forming the pinna and external ear canal. Soon the first branchial pouch evaginated forming the middle ear. Where the groove and the pouch joined, development apparently became arrested forming the tympanic membrane. While this took place, the adjacent cartilages (namely, the first or Meckel's cartilage and the second or Reichert's cartilage) were coiling and folding to form the ossicular chain of the middle ear [3]. Thus we see the structures of the middle and external ear superimposed upon the retained marine mechanism of the inner ear. One of the problems that had to be solved while this process was occurring was how to overcome the resistance that the fluid of the inner ear offered to being moved when airborne sound pressure was transferred to it. This was solved by building the new tympanic membrane in the middle ear many times larger than that of the old marine tympanic membrane. The ossicles were then arranged in a lever mechanism that would further augment the incoming sound pressure but modify the resultant rebound phase so as not to damage the friable structures of the inner ear. Thus the impedance of the hydraulic mechanism of the inner ear was matched by the increased surface-lever ratio of the middle ear. Otologists call this the impedance-matching mechanism of the middle ear.

After the discovery and use of chemotherapy (1936), an American otologist, Julius Lempert [4], evolved the one stage fenestration operation for the millions of patients with inadequate hearing resulting from clinical otosclerosis. Following this, otologists on this continent were stimulated to master the tedious technics of this reconstructive, rehabilitative procedure. They were apparently so engrossed in this discipline that they paid little attention to the reclamation of deafened casualties returning from the theaters of World War II.

Fritz Zöellner [5] and Horst Wullstein [6], two ingenious German otologists, added their labors to the task of restoring serviceability to their countrymen's maimed conductive hearing mechanism. A great share of the acclaim for the rationale of the modern tympanoplasty is given to these two men.

Meanwhile, antibiotic therapy emerged to supplement chemotherapy; this was further augmented by molecular biologic research discoveries, mediated by tagged radioactive elements, to enhance more efficiently physiologic processes. These scientific advances encouraged contemporary otologic surgeons to endeavor to overcome obstacles that had thwarted their predecessors in their surgical efforts to reconstruct the middle ear mechanism at about the turn of the century [7–9]. Consequently, war casualties and civilians who had a good receptive acoustical hearing component (the neurolabyrinthine marine apparatus) combined with an adequate eustachian tube mechanism to supply air for pressure differential became candidates for reconstructive middle ear surgery; and an attempt was made to restore their hearing to serviceability.

However, many obstacles confronted the surgeon, such as: reconstruction of a part or all of the tympanic membrane; restoration of a part

or all of an ossicle of the ossicular chain; control of granulations with its attendant cicatrix obviating sound pressure transformation through the middle ear; eradication of cholesteatomas resulting from the skin's overgrowth of the middle ear mucosa by way of the tympanic membrane.

Let us consider the first of these obstacles, namely, reconstruction of a part or all of the tympanic membrane; this membrane normally has a mucosal lining and, in all except the flaccid portion of the structure, it is made up of three main layers: an inner layer of mucous membrane, a middle supporting layer of fibrous bands both circular and radiating, and an outer layer of thin skin which is devoid of rete pegs. In a current effort to repair a small perforation of this dual-functioning tympanic membrane, cauterization of the remnant and the placing of a patch upon it were revived [*10,11*]. Various types of skin grafts were then attempted for larger perforations. Although skin could be used for cover, it could not be utilized for lining because of the danger of forming destructive cholestetomas in the tympanic cavity. Recently, after some ten years of trial and error, otologists who are interested in this reconstructive problem have found that Wullstein's [*14*] use of an unlined free full-thickness skin graft from the postauricular area where the skin's appendages are most sparse is of the greatest utility. Lying, as it does, in the direct operative field, this location constitutes an excellent donor area [*13*]. This unlined free full-thickness graft is then adapted to the denuded external surface of the remnant of the tympanic membrane; 2 or 3 mm. or more of the abraded adjacent ear canal's skin are included to augment the recipient blood supply. The opening in the tympanic membrane is bridged over by filling up the tympanic cavity with small pieces of Gelfoam® impregnated with a mycin-free antibiotic (usually penicillin) and cortisone mixture. This nutritive Gelfoam mixture (called "formed drops") is used to fill in the tympanic defect and complete the bed for the trimmed graft. The free full-thickness graft is then placed over this three-structured bed and a layer of the Gelfoam mixture is placed upon this. A layer of sterile marine sponges may be used to complete the immediate pressure dressing.

Although many otologic surgeons justifiably claim to have mastered this graft technic (Wullstein claims a 90 to 95 per cent take [*15*]), others experience a good initial take after which the drum may perforate and break down with a loss of the previous hearing gain. It seems evident that these dehiscences will be prone to occur until surgical reconstructive technics can build a graft more nearly approaching all three functioning layers of the normal tympanic membrane.

A foundation for solving this problem is presented in the hope that surgeons who have experienced success in reconstructive surgical technics may see fit to offer some constructive criticism for surgeons who are interested in this rehabilitative procedure.

REFERENCES

1. Shambaugh, G. E., Jr. Surgery of the Ear, Chap. 13, p. 333. Philadelphia, 1959. W. B. Saunders Co.
2. Gray, O. A brief survey of the phylogenesis of the labyrinth. *J. Laryng. & Otol.*, 69: 151, 1955.
3. Bast, T. H. and Anson, B. J. The Temporal Bone and the Ear. Springfield, Ill., 1949. Charles C Thomas Co.
4. Lempert, J. Improvement of hearing in cases of otosclerosis: a new, one stage surgical technique. *Arch. Otolaryng.*, 28: 42, 1938.
5. Zöllner, F. Die radikal Operation mit besonderem Bezug auf die Hörfunktion. *Ztschr. Laryng. Rhin. Otol.*, 30: 104, 1951. Cited by Shambaugh, G. E., Jr. [*16*].
6. Wullstein, H. Funktionelle Operationen in Mittleohr mit Hilfe des Freien Spaltlappen Transplantatos. *Arch. Obren- Nasen- Keblkopfh.*, 161: 422, 1952. Cited by Shambaugh, G. E., Jr. [*16*].
7. Miot, C. De la Mobilisation de l'etrier et son Procédé Operatione. *Rev. laryng.*, 10: 49, 83, 113, 145, 200, 1890. Cited by Shambaugh, G. E., Jr. [*16*].
8. Blake, D. J. Middle ear operations. *Tr. Am. Otol. Soc.*, 5: 306, 1892. Cited by Shambaugh, G. E., Jr. [*16*].
9. Jack, F. L. Further observations on removal of the stapes. *Tr. Am. Otol. Soc.*, 5: 3, 474–499, 1893. Cited by Shambaugh, G. E., Jr. [*16*].
10. Linn, E. G. Closure of tympanic membrane perforations. *Eye, Ear, Nose & Throat Month.*, 23: 185, 1944.
11. Derlacki, E. L. Repair of central perforations of the tympanic membrane. *Arch. Otolaryng.*, 58: 405, 1953.
12. Moritz, W. Hörverbessernde Operationen bei chronisch-entzündlichen, Prozessen beider Mittelohren. *Ztschr. Laryng. Rhin. Otol.*, 29: 578, 1950.
13. Sooy, F. A. A method of repairing a large marginal tympanic perforation. *Ann. Otol. Rhin. & Laryng.*, 65: 911, 1956.
14. Wullstein, H. Techniques of tympanoplasty I, II and III. *Arch. Otolaryn.*, 71: 424, 1960.
15. Wullstein, H. Unsolved problems of tympanoplasty. *Arch. Otolaryn.*, 71: 588, 1960.
16. Shambaugh, G. E., Jr. Surgery of the Ear, p. 386. Philadelphia, 1959. W. B. Saunders Co.

Classification and Management of Mandibular Asymmetry

EDWARD C. HINDS, D.D.S., M.D., LOY C. REID, D.D.S., *Houston, Texas,* AND COL. RICHARD J. BURCH, D.D.S., *Tuscon, Arizona*

THE condition known as mandibular asymmetry is attracting increasing attention as the over-all interest in diagnosis and treatment of all types of jaw deformities increases. As recently as 1951, Gottlieb [9] could find fewer than fifty cases reported in the literature. At that time he added twelve new cases. There have been several reports during the interim [2,6,11,13,16,17].

Rushton [14,15] thoroughly reviewed the histology of the mandibular condyle as well as its role in mandibular growth. Brodie [3] studied the growth patterns of the mandible during the first eight years of life by means of cephalometry.

Gottlieb [9], in his publication in 1951, defined mandibular asymmetry, discussed the possible etiologic factors and cited the chief complaints and characteristic findings. He classified these cases as osteoma or deviation prognathism and described four methods of surgical therapy: (1) condylectomy, (2) bilateral osteotomy, (3) body ostectomy, (4) local excision of the mental protuberance. There has been little information which can be added to the work of Rushton and Gottlieb regarding this particular entity.

The need for a satisfactory classification has been recognized by many [6,10,17]. Rowe [13] has suggested a classification based on theories of origin which, although somewhat appealing, are difficult to adapt to actual cases. One must begin with an acceptable definition. In our opinion, mandibular asymmetry involving overgrowth of a condyle is manifested by a noticeable external deformity, either deviation to the opposite side or downward growth on the involved side associated with one of the following: (1) crossbite, (2) unilateral open bite, or (3) tilting of the plane of occlusion. The crossbite may be in the anterior region although it is more apt to be present on the uninvolved side. Marked mesial occlusion, or open bite, is most apt to be seen on the involved side.

In the past this entity has been attributed to the following: (1) hyperplasia, (2) hypertrophy, (3) osteoma, (3) osteochondroma and (5) deviation prognathism.

MICROSCOPIC STUDIES

Histologic studies should contribute much to the understanding of this problem. Since a large number of these patients do not seek treatment and condylectomy is only one of several methods of surgical management, it may be some time before a sizable collection of histologic studies is available. However, several such reports are already on record [2,4,6,11,15–17]. Many of these have been reported as normal bone. The positive findings would lead one to believe that histologically we must conclude that we are dealing with one of the following conditions: osteoma, osteochondroma (exostosis), or simple hyperplasia.

Hyperplasia, admittedly, would seem more acceptable but such an entity does not seem to exist microscopically as far as bone pathology is concerned. Although the vast majority of these cases have developed during childhood or puberty, occasional cases have been reported after maturity. It would seem desirable to be able to explain all of these cases as being due to one process. Rushton's [14] work may have been helpful in this respect. As maturity is reached (between sixteen and a half and twenty-one years of age) formation of cartilage ceases and the area is sealed off from the marrow by a closing plate of bone, but inactive precartilagi-

nous tissue still remains so that reactivation is possible in certain circumstances. Rushton states that the cartilaginous layer at this stage is, on the average, .3 cm. in thickness. Histologic examination of one of his cases revealed both formation of cartilage and osteogenesis proceeding actively. There was no closing plate of bone which should have appeared about ten years previously in the twenty-eight year old patient. The combined thickness of precartilaginous and cartilaginous layers was greatly increased, being in parts greater than that which is normal at birth, and the inclusion of cartilage matrix could be recognized nearly 1 cm. below the surface of the condyle.

It seems that the earlier this condition appears, the greater the extent of deformity and distortion, although the relation of the upper and lower teeth is more apt to remain normal as the plane of occlusion becomes tilted rather than shifted into crossbite and the maxilla enlarges in unison with the mandible. In older patients one is more apt to see distortion of the condyle, *per se*. The three cases in our series occurred in patients over twenty years of age. All show marked distortion of the condylar heads. Rushton commented on the similarity between this entity and the single exostoses covered with cartilage (osteochondroma of the long bones), particularly with regard to the age of onset and life history.

Inasmuch as mandibular asymmetry may involve either overgrowth or recessive growth or development, and since these conditions basically can have only two causes (genetic or acquired), the following classification is suggested:

I. Inherent (genetic)
   A. Deviation prognathism
   B. Condylar recession or absence (hypoplasia)
II. Acquired
   A. Developmental
      1. Hyperplasia (osteochondroma)
      2. Hypoplasia
         a. Infection
         b. Trauma
   B. Mechanical
      1. Tumor (unilateral protrusion)
      2. Trauma (unilateral recession)
      3. Surgery (unilateral recession)

We will attempt to demonstrate that most cases of mandibular asymmetry associated with condylar overgrowth fall in the category of acquired development. The symptoms and indications for treatment are much as described by Gottlieb [9], and consist primarily of cosmetic deformity. Secondary complaints include pain, joint noises and impaired mastication. Interestingly enough, patients with this deformity seem to adjust much better than patients with mandibular prognathism as manifested by the individual's lessened desire for treatment. This, however, may be related to a delayed comprehension of the problem and lessened understanding of the management of mandibular asymmetry as compared with mandibular prognathism. Gottlieb has reviewed the surgical methods of treatment very adequately. However, more complicated multiple surgical procedures have been reported and may be necessary in certain instances [5,12,13].

Since 1956 we have seen fourteen such cases of mandibular asymmetry at the University of Texas Dental Branch and an additional three cases at the Lackland Air Force Base Hospital. These are summarized herein and four cases are reported in detail.

FINDINGS

Ten of the total number of patients (seventeen) were women and seven were men. The average age at the time of examination was twenty-seven while the average age of onset was sixteen. This is broken down according to number occurring in each decade in Table 1. The average age at onset was calculated on a basis of thirteen cases since four were said to have been noted in childhood and no definite age was given (included in the group 10 to '20 years of age in the tabulations in Table 1). Seven cases involved the left condyle and ten the right. Of the total of seventeen cases, only five were asymptomatic. The symptoms ranged from persistent pain to fullness in the ear and

TABLE 1
AGE AT ONSET AND INITIAL EXAMINATION

Age Range	Onset*	Initial Examination*
1–10	3	1
10–20	11	3
20–30	1	8
30–40	2	1
40–50		4

* Figures indicate number of patients in age range.

TABLE II
SYMPTOMS OF MANDIBULAR ASYMMETRY

Symptom	No. of Patients
Pain	6
Joint noises	6*
Difficult chewing	4
Limitation of motion	3
Impaired hearing	1
Fullness in ear	1
Asymptomatic	5

* Bilateral in one patient.

impaired hearing and are listed in Table II. Anatomical deviation is consistently noted prior to appearance of any symptoms. One might suppose, for instance, that the patient seen at age four may develop symptoms subsequently.

Physical findings (Table III) of significance were as follows: four patients manifested an anterior crossbite; there were nine patients with crossbite on the opposite side, but none with a significant crossbite on the involved side although there was a rather marked overject in one instance. There were three patients who had an open bite on the involved side. Two patients had a prognathic relationship. One of these had an anterior crossbite, but the posterior teeth were in a Class III relationship. The other patient was essentially edentulous and measurements made following bilateral osteotomy indicated that this patient's mandible deviated laterally 14 mm. and posteriorly 19 mm. In two cases there was a marked tilting of the occlusal plane, the occlusal relationship otherwise being normal. The plane was tilted downward on the involved side.

One interesting phenomena is the downgrowth of the mandible. Seven of our patients demonstrated this on the involved side and it was more pronounced than the deviation. Associated findings such as crossbite and open bite are summarized in Table IV.

The question of increased height of the body of the mandible on the involved side naturally presents itself. We have found it very difficult to evaluate this factor roentgenographically. No attempt at direct measurements have been attempted. At the present time we have no valid evidence as to whether or not there may be an increased height of the body of the mandible on the involved side in some instances. Obviously an open bite or a tilting of the occlusal plane can account for downward displacement of the body of the mandible. If neither one of these conditions are present, one must assume there must be some increase in vertical dimension. Figure 1 demonstrates a different type of mandibular asymmetry in which the condyle itself is apparently not involved, but the enlargement or hypertrophy involves primarily the ascending ramus. Rushton [*14*], has also mentioned complete unilateral hypertrophy in which one entire side of the body is enlarged. In spite of the extent of gross deformity in most of these patients the condyle was palpably enlarged in only four.

Roentgenographic findings were as follows: thirteen of the seventeen patients had a markedly enlarged condylar head on the involved side; the remaining four showed slight or equivocal unilateral enlargement. One of the patients who had only slight enlargement was a four year old girl and it would be antici-

TABLE III
PHYSICAL FINDINGS

Finding	No. of Patients
Crossbite	
Anterior	4
Involved side	0
Opposite side	9
Open bite	
Anterior	0
Involved side	3
Opposite side	0
Prognathism (Class III relationship)	2
Tilting of plane of occlusion	2
Downgrowth of mandible (involved side)	7
Enlarged condyle (by palpation)	4

TABLE IV
DOWNGROWTH AND ASSOCIATED FINDINGS

Finding	No. of Patients
Mandibular downgrowth predominant	7
Associated findings	
Open bite (involved side)	2
Plane of occlusion tilted	2
Anterior crossbite	3
Increase in vertical dimension	?

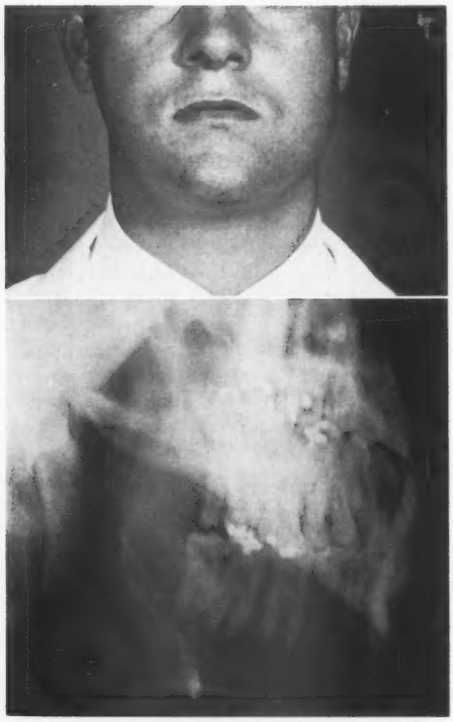


FIG. 1. A, unusual type of mandibular asymmetry in which condyles are not involved; abnormality is limited to hypertrophy or hyperplasia of the ascending ramus, there is no deviation downgrowth or alteration of occlusion. B, roentgenogram demonstrating thickening of ascending ramus. This case did not fall within the group herein presented and was not included in the review.

pated that this would become considerably more enlarged as time progresses. No unilateral enlargement was noted in the two cases considered to be deviation prognathism. Almost all of these patients have an associated elongation of the condylar neck. A gross distortion of the condylar head was seen in three patients. It was of particular interest to note that the three cases manifesting marked distortion of the condylar head were all cases originating after twenty years of age. Roentgenographic findings and etiology are summarized in Tables v and vi.

Although a history of trauma was elicited in five cases, it is doubtful that these traumatic incidents were related to the development of the lesion. Some of the instances of trauma were very mild, such as injuring the jaw while eating

TABLE V
ROENTGENOGRAPHIC DATA

State of Condylar Head	No. of Patients
Markedly enlarged	13
Slightly enlarged or inconclusive	4
Distorted	3

TABLE VI
ETIOLOGY

Etiologic Factors	No. of Patients
Trauma	2
Familial incidence	2*
Infection	0

* One brother had an end-to end bite and another a protruding chin.

a sandwich. Injuries to the face or jaw are very common and many are insiginficant. The significance of such trauma is hard to evaluate. Gerry and Sangston [8], reported a 20 per cent incidence of deviation of the jaw in newborn infants which was thought to be due to intrauterine pressure. In every instance, these mandibles returned to normal after a period of time varying from several days to several weeks. There was some history of familial evidence in two cases; however, none of these involved other members of the family with mandibular asymmetry. In one instance there was a history of end-to-end bite and in the other a protruding chin. There was no instance of a history of infection associated with onset of mandibular asymmetry.

Methods of treatment are summarized in Table VII. Ten of these seventeen patients

TABLE VII
METHOD OF TREATMENT

Treatment	No. of Patients
Condylectomy	3
Subcondylar osteotomy	
Bilateral	4
Unilateral	3
Prosthesis	3*
None	6

* Two of these patients also were operated upon.

have been operated upon. Prosthetic appliances were utilized in three instances and this treatment was considered satisfactory in only one. Six of the total number have had no treatment including the four year old girl who may require treatment later on. The other five did not desire treatment and did not have symptoms of any significant magnitude. The two cases with the most severe external deformity also had tilting of the occlusion and would require rather complicated surgery. Fortunately, these two individuals did not desire any surgical treatment.

PATHOLOGY REPORTS

Of the total of seventeen cases, three were corrected by condylectomy and the resulting microscopic studies have been of some help in understanding this condition. All three of these surgical specimens were approximately 4 cm. in their widest diameter which is considerably larger than the average adult condyle which approaches 2.5 cm.

Case I, a thirty-five year old white woman, underwent surgical excision of the condyle on August 2, 1957. The articular cartilage was hyalin and relatively thin. The underlying bone was more dense than usual in that the trabeculae were thick and the cortical portion along one edge was considerably hyperplastic or more dense and thick than usual. Extensions of hyalin cartilage into the underlying bone tissue were present. These were interpreted as bone growth with formation of osteoid around this mature cartilage. Pathologic interpretation is that this is an active osteochondroma or a hyperplasia of bone and cartilage of this mandibular condyle.

Case XIV, a forty-three year old white man, had surgical excision of the condyle on June 11, 1959. The surface cartilage was hyalin cartilage with some irregular arrangement of chondrocytes and slight extension of cartilage into the underlying bone. For the most part, however, there was a distinct subchondral plate of bone tissue. In general the cortex was thick in some places and thin in other places. The trabeculae were well formed and relatively uniform. The marrow was hematopoietic and contained normal adipose tissue as well. Pathologic interpretation is that this is an osteochondroma of the mandible with apparent inactivity of the growth phase or at least minimal echondral bone formation at this stage.

A sixteen year old white girl (Case XV) underwent surgical excision of the condyle on June 18, 1957. The articular hyalin cartilage layer was thick and active with respect to the zone of maturation being present and there was extension of columns of cartilage into the underlying bone. Here there was apposition of osteoid onto the cartilage. No discrete subchondral plate was apparent. The cortex and trabeculae as well as the bone marrow appeared to be normal. Pathologic interpretation is that of active hyperplasia of the condyle.

HISTORY

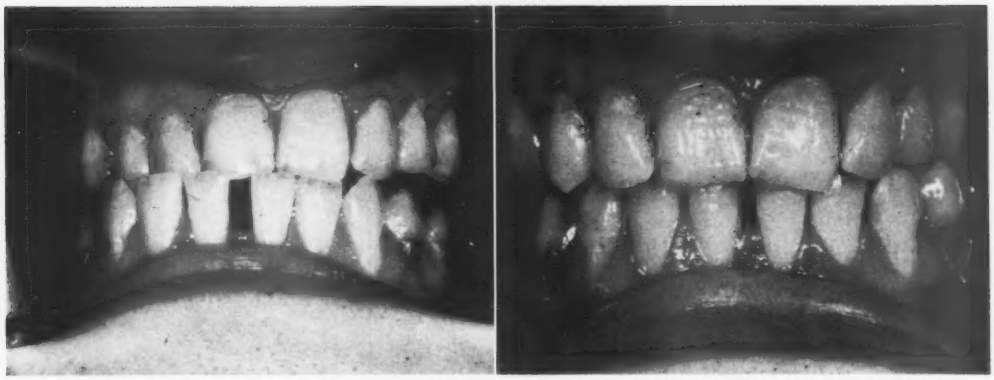
Case IV, a twenty-seven year old white female, was first examined on March 5, 1960. This patient's mandible had deviated to the right as long as she could remember. For ten years she had had clicking noises in the temporomandibular joint bilaterally and fullness in the ears. Ten years previously a lower partial denture was constructed for her. This had facilitated her chewing and improved her appearance slightly. Nevertheless, she still complained of joint noises and fullness in the ears.

Physical examination revealed a marked deviation of the chin to the right. Examination of the occlusion revealed a marked shift to the right with a crossbite on the right, or uninvolved side, and open bite on the left or involved side. (Fig. 2A.)

A unilateral (left) subcondylar osteotomy was performed on March 18, 1960. Fixation was facilitated by means of dental splints previously constructed and was discontinued on April 20, 1960. The patient obtained a good result which was increased by occlusal equilibration. (Fig. 2B.)

A white boy fifteen years of age (Case VIII) was examined on April 17, 1956. This patient's chief complaint was asymmetry of the face characterized by convexity and elongation of the right side of the jaw and a tilting of the plane of occlusion so that the right side was lower than the left. (Fig. 3A and B.) There were no symptoms; the only abnormality was cosmetic. Roentgenograms revealed a markedly enlarged right condyle. This patient was not bothered by this condition and surgery was deferred.

The patient was seen again four years later, April 1960, at which time there were no significant changes in the jaw although the



A B

FIG. 2. A, occlusal view of Case IV demonstrating open bite on involved side and crossbite on opposite side. B, occlusal view following correction by unilateral subcondylar osteotomy; osteotomy performed on involved side.

A B

FIG. 3. A, Case VIII; unliateral condylar hyperplasia involving right side with history of origin early in life demonstrating marked downgrowth on the involved side. B, occlusal view of same patient showing tilting of occlusion toward the involved side; relation to upper and lower teeth otherwise unaltered.

patient had gained approximately five inches in height. He was still asymptomatic and did not desire to have surgery.

Case XIV had been examined for the first time on May 28, 1959. He complained of facial asymmetry which was characterized by deviation of the mandible to the left. This deviation was first noticed about eight years previously and was associated with pain in the right temporomandibular joint which has persisted during this period. This patient also complained of clicking noises in the joint.

Examination revealed an asymmetry characterized by deviation of the lower jaw to the right. (Fig. 4A.) Examination of the occlusion revealed a marked open bite on the right or involved side. (Fig. 4B.) The patient wore a prosthetic appliance which corrected the open bite, but did not relieve the pain or clicking in the right temporomandibular joint. He also complained of pain in the area of the temporomandibular joint and associated headaches. A large condyle was palpated on the right side. A crossbite was present on the left.

On June 11, 1959, a right condylectomy was performed. At surgery a grossly enlarged and distorted condyle was found. The postoperative result was considered quite good and improved with occlusal equilibration. (Fig. 4C and D.)

The initial examination of Case XV was on June 17, 1957. She complained of facial asymmetry characterized by deviation of the man-

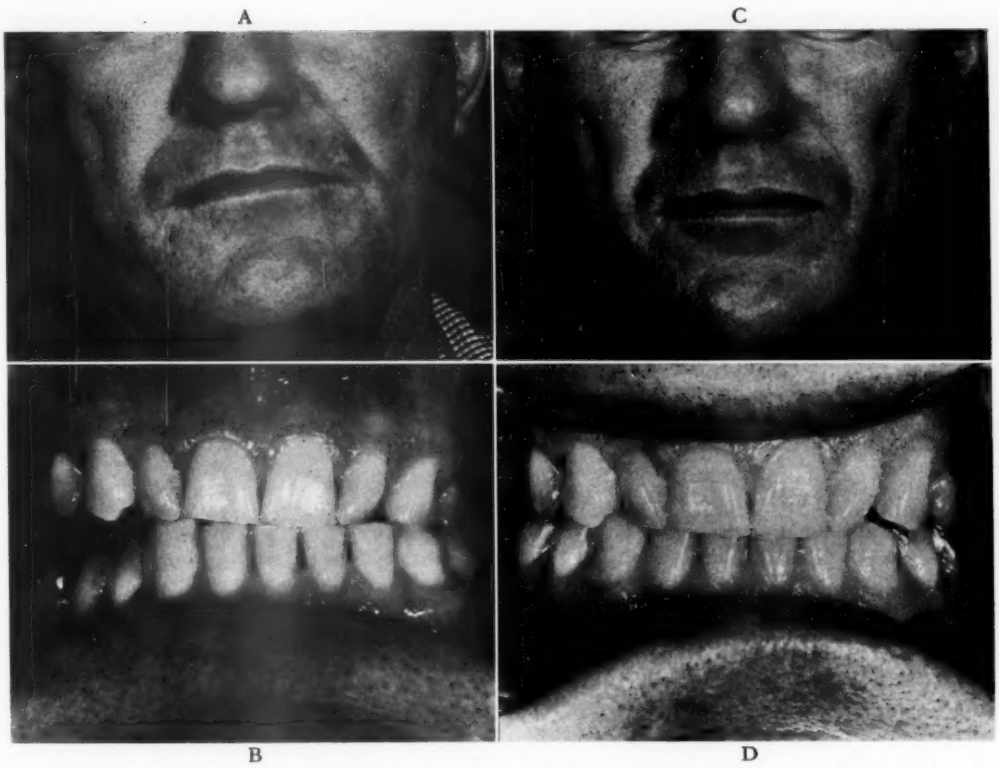


FIG. 4. A, Case XIV; unilateral condylar hyperplasia involving right side with onset at age thirty-five. There is a significant downgrowth on the involved side. The condylar head was grossly distorted. B, preoperative occlusal view showing open bite on involved side and crossbite on uninvolved side. C, postoperative view. D, occlusal view following removal of the involved condyle.

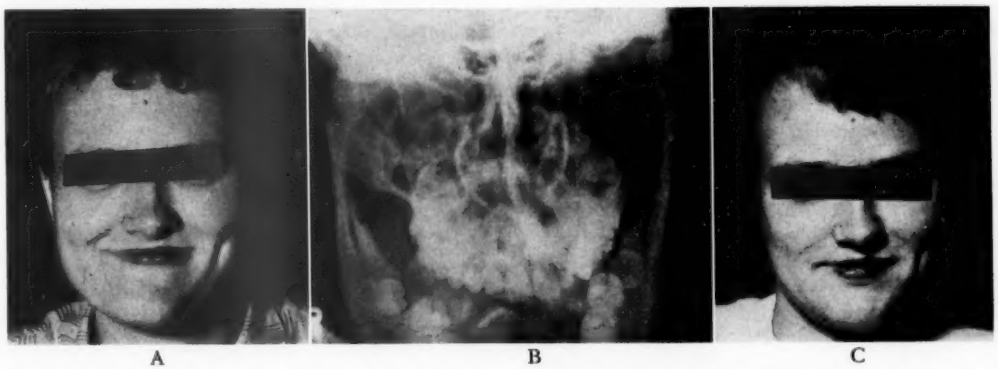


FIG. 5. A, Case XV; demonstrates hyperplasia of the left condyle in a patient still in the growing period. B, roentgenogram of same patient showing characteristic enlargement of involved condyle. C, Photograph of the same patient made approximately one year after high condylectomy on the involved side during which time the patient demonstrated increasing improvement in facial appearance.

FIG. 6. Case XV; photomicrograph of condyle head. A, fibrous layer; B, cartilaginous layer; C, area of closing plate of bone; D, bone marrow; there is marked thickening of cartilaginous layer, incompleteness of closing plate of bone, and extension of cartilage into the bone marrow (all indicative of growth activity).

dible to the right. This had been present for approximately eighteen months. The patient had been told that this condition could not be corrected by orthodontics.

Physical examination revealed marked asymmetry of the face with deviation of the jaw to the right and apparent downgrowth of the left side. (Fig. 5A.) Examination of the occlusion revealed deviation of the mandible to the right with an anterior crossbite. Roentgenogram demonstrated a markedly enlarged left condyle. (Fig. 5B.)

On June 18, 1957, a high condylectomy was performed on the left side. The postoperative result was good and there seemed to be even further improvement one year later. (Fig. 5C.) The excised condyle was approximately 4 cm. in width and microscopic study revealed evidence of growth activity. (Fig. 6.)

COMMENTS

In the past, the majority of these patients have been treated by condylectomy. We have recently obtained excellent results with unilateral subcondylar osteotomy, a much less hazardous procedure which results in a normal functioning mandible. However, one advantage of condylectomy is the opportunity for study of the surgical specimen. This actually represents two advantages: (1) it allows one to determine whether or not a malignant disease process exists, and (2) it allows one to collect additional information regarding the nature of these problems.

We have found, as did Gottlieb [9], that these cases seem to fall into one of two categories: (1) deviation prognathism, prognathic asymmetry in which the deviation is more prominent than the prognathism; and (2) true unilateral hyperplasia of the condyle.

We have not found such striking evidence of familial incidence in this condition as we have with mandibular prognathism, in which approximately 30 per cent of our patients have other members of the family with the same or similar conditions. This might be taken as evidence for an acquired rather than a genetic origin.

Only one of the seventeen cases had an apparent associated masseteric hypertrophy as reported by Eubanks [7]. Three of these patients were evidently still in progressive stages at the time they were seen by us. Two of them were still in the growing period and the third was thirty-five years of age.

We have been struck by the marked difference in complaints of patients with prognathism as compared with those with mandibular asymmetry. The latter patients are prone to have many complaints other than cosmetic, including such things as joint noises, pain, difficulty in mastication and limitation of motion. Those cases with the most distorted mandibular contour are those which were first noted at a very early age. In two of our most dramatic cases, there was a tilting of the plane of occlusion rather than formation of crossbite. However, the most recent case which we have seen was in a four year old girl with an obvious unilateral hyperplasia who seems to be developing a crossbite. This patient has an identical twin with normal occlusion.

We believe that these cases, with the exception of those which might be considered deviation prognathism, all involve essentially the same process—hyperplasia of the growth center of the condyle—even those which apparently have onset after maturity. Rushton suggested that there are latent growth centers throughout life in these areas and it would seem possible that these growth centers might be stimulated late for some reason. The two cases considered to be deviation prognathism in this series showed a definite Class III relationship as well as a deviation, and a unilateral enlargement of the condyle could not be demonstrated. It

should be noted that most prognathic individuals demonstrate some deviation, but in these two cases the deviation and crossbite were quite pronounced.

We do not believe that the unilateral condylar enlargement can be properly termed osteoma or osteochondroma as it does not seem to be a true tumor and does not have any of the characteristics manifested by osteochondromas or ecchondrosis. At the present time, we favor unilateral subcondylar osteotomy on the involved side as the treatment of choice. This series obviously is not large enough to obtain any definite conclusion regarding treatment. As mentioned before, there are definite advantages to performing condylectomy. In one of the cases reported, Case xv, the principle exploited by Blount [*1*] (stapling growth centers of the femur to allow the short side to catch up with the long side) was used. It was believed that by picking the proper time in the growth period, one could resect the growth center by means of a high condylectomy allowing the opposite jaw then to catch up during the remaining period of growth activity. The result was encouraging since the patient seemed to have an increased improvement one year after surgery over that obtained immediately after surgery.

There have been other opinions on the matter of timing. Gruca and Meisels [*10*], thought that the earlier the operation was done, the smaller the deformity would be and that early operation was an absolute indication. Rushton [*14*], on the other hand, believed that the proper method was to wait until the progressive nature of the deformity was beyond doubt and until a point had been reached at which condylectomy would leave the two sides approximately equal. Obviously, if a hyperplastic condyle is resected too early, the normal condyle then may progress to produce asymmetry to the opposite side.

One of the most interesting aspects of this study has been the comparative frequency of incidence as compared with other studies. The seventeen patients in this study have been seen since 1956.

SUMMARY

The condition of mandibular asymmetry associated with overgrowth of a condyle is discussed. A series of seventeen cases seen in the past four years is recorded. Subjective and objective findings, as well as treatment, have been discussed. On the basis of this study, the following opinions have been evolved:

1. Mandibular asymmetry involving condylar overgrowth seems to fall in two categories. They are: unilateral condylar hyperplasia, and deviation prognathism (condyles approximately the same size).

2. Of seventeen cases reviewed in this presentation, fifteen were considered to be unilateral condylar hyperplasia and two were deviation prognathism.

3. Condylar hyperplasia makes up by far the largest number of this group, and is probably a true hyperplasia rather than an osteoma or osteochondroma.

4. In rare instances mandibular asymmetry may involve hyperplasia or hypertrophy of parts of the mandible other than the condyle. Involvement of the ascending ramus is seen in Figure 1. It may be possible that the entire half of the mandible or half of the body (hemihypertrophy as mentioned by Rushton) may be involved.

5. The bulk of these cases occur in the growth period, although some cases may arise later.

6. There is considerable evidence that unilateral mandibular hyperplasia is not associated with familial incidence, evidence which favors acquired rather than genetic origin.

7. The earlier the age of onset, the more diffuse distortion one is apt to see although onset after maturity usually leads to exaggerated distortion in the area of the condylar head *per se*.

8. Mandibular asymmetry, unlike mandibular prognathism, produces many symptoms, including pain, joint noises and interference with motion.

9. Mandibular asymmetry may be treated surgically by condylectomy, subcondylar osteotomy, ostectomy in the body of the mandible, or by more complicated procedures in isolated cases. A few are benefited by prosthetic appliances and a rather significant number do not require or desire treatment.

10. Although this condition is not believed to be malignant or predisposed to malignancy, one must always keep in mind malignant disease in the differential diagnosis.

REFERENCES

1. Blount, W. P. and Zeier, F. Control of bone length. *J. A. M. A.*, 148: 451, 1952.

2. Broadway, R. T. Two cases of unilateral hyperplasia of the mandibular condyle. *Proc. Roy. Soc. Med.*, 51: 691, 1958.
3. Brodie, A. G. On the growth pattern of the human head. *Am. J. Anat.*, 68: 209, 1941.
4. Brown, J. B., Peterson, L., Cannon, B. and Moore, A. M. Facial asymmetry and malocclusion from hyperplasia of the mandible: correction by operation. *Plast. & Reconstruct. Surg.*, 1: 284, 1946.
5. Converse, J. M. and Shapiro, H. H. Treatment of developmental malformations of the jaws. *Plast. & Reconstruct. Surg.*, 10: 473, 1952.
6. Curtin, J. W. and Greeley, P. W. Osteochondroma of the mandibular condyle, case report with histologic, radiographic and electromyographic observations. *Plast. & Reconstruct. Surg.*, 24: 511, 1959.
7. Eubanks, R. J. Surgical correction of masseter muscle hypertrophy associated with unilateral prognathism: report of case. *J. Oral Surg.*, 15: 66, 1957.
8. Gerry, R. G. and Sangston, R. E. Congenital mandibular deformities in newborn infants. *Am. J. Ortbodontics*, 32: 439, 1946.
9. Gottlieb, O. Hyperplasia of the mandibular condyle. *J. Oral Surg.*, 9: 118, 1951.
10. Gruca, A. and Meisels, E. Asymmetry of the mandible from unilateral hypertrophy. *Ann. Surg.*, 83: 755, 1926.
11. Huebsch, R. F. and Stephenson, T. D. Unilateral benigh osteogenic enlargement of the mandibular condyloid process: report of cases. *J. Oral Surg.*, 14: 162, 1956.
12. McNichol, J. W. and Roger, A. T. An original method of correction of hyperplastic asymmetry of the mandible. *Plast. & Reconstruct. Surg.*, 1: 288, 1946.
13. Rowe, N. L. The aetiology, clinical features and treatment of mandibular deformity. *Brit. Dental J.*, 108: 45, 1960.
14. Rushton, M. A. Growth at the mandibular condyle in relation to some deformities. *Brit. Dental J.*, 73: 57, 1944.
15. Rushton, M. A. Unilateral hyperplasia of the mandibular condyle. *Proc. Roy. Soc. Med.*, 39: 431, 1946.
16. Taylor, R. S. and Cook, H. P. The surgical correction of skeletal deformities of the mandible. *Brit. Dental J.*, 105: 349, 1958.
17. Thoma, K. H. Tumors of the condyle and temporomandibular joint, *Oral Surg.*, 7: 1091, 1954.

Treatment of Fractures of the Mandibular Condyloid Process in Children

A. P. PANAGOPOULOS, D.D.S., M.D. AND MARIO D. MANSUETO, M.D., *Chicago, Illinois*

From the Department of Otolaryngology, College of Medicine, University of Illinois, Chicago, Illinois.

MAXILLOFACIAL fractures in children present early as well as late problems for the surgeon. These fractures were uncommon in children in the past* but occur more often today. This is due primarily to modern travel and speed. The National Safety Forum states that 73 per cent of those injured in motor vehicle accidents had head and facial injuries. Other categories, including home and playground, increase the incidence of facial injury. Thus the increasing interest of specialists in this matter is understandable.

Of the various maxillofacial fractures we believe that the most important is fracture of the mandibular condyloid process. Evidence of this can be found in everyday practice in which results of undiagnosed, mistreated, or neglected fractures can be seen. These poor results include asymmetry of the face, micrognathism of the mandible, ankylosis of the temporomandibular joint, open bite, malocclusions and often psychic problems.

Figure 1 shows three examples of neglected fractures, demonstrating in general the degree of deformity related to the age of the patient when fracture occurred. To the left is the resulting asymmetry from a fracture occurring in the preschool age, in the middle that occurring in the grammar school age, and on the right that occurring in the high school age. The younger the person in whom the fracture occurs, the greater the disturbance of the growth pattern.

Fractures of this type easily escape early diagnosis. Several factors contribute to this. First, there is frequent absence of the cardinal symptoms, namely, (1) displacement of the

* Previously compiled statistics by the first author revealed that of 1,500 patients with fractured jaws treated in his department between 1941 to 1949, only twenty-two, approximately 1.4 per cent, occurred in children.

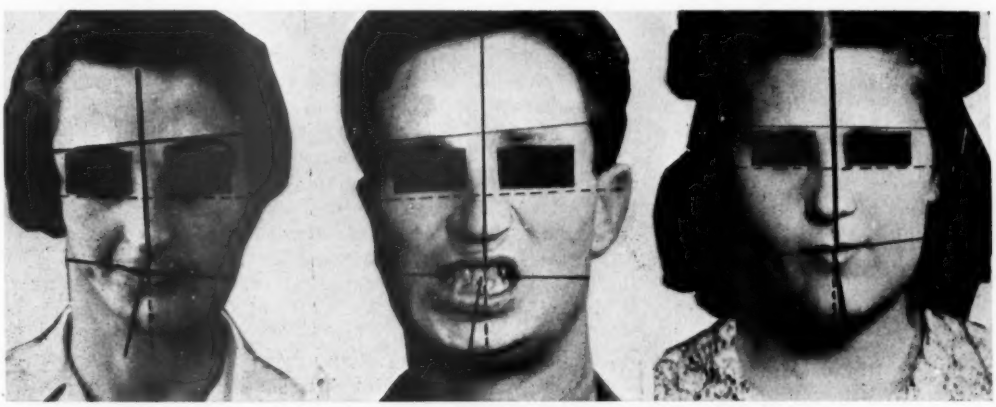


FIG. 1. This shows three examples of neglected fractures. (See text.)

FIG. 2. Photograph of a model of the area of the temporomandibular joint where the anterior part of the mandibular ramus and coronoid process were removed. It demonstrates some of the anatomic factors that contribute to the splint-like action after immobilization of the mandible to the maxilla. A, the capsule of the temporomandibular joint. B, the temporomandibular ligament. C, the external pterygoid muscle. D, the internal pterygoid muscle.

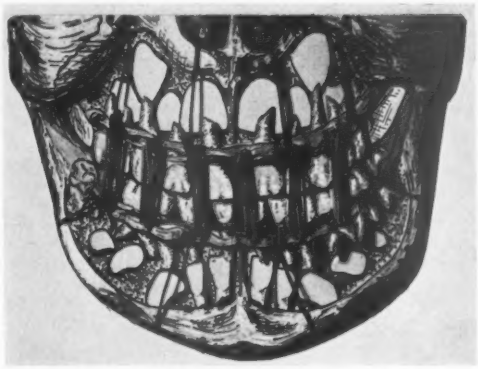


FIG. 3. This model demonstrates a combination of circumferential and perialveolar wiring advocated by the first author for treatment of the mandibular condyloid process fracture. The wire is seen around the body of the mandible and attached to the lower arch bar. In the maxilla the perialveolar wiring is attached in the most desirable location for stabilization of the upper arch bar. Elastics maintain the immobilization.

mandibular midline to the side of the fracture; (2) difficulty in opening the mouth; and (3) local ecchymosis, edema and pain. Second, roentgenograms are sometimes unsatisfactory. It is indeed a difficult matter to get cooperation and obtain adequate roentgenograms from a frightened five year old patient. The resulting superimposed bony structures from the temporal, zygomatic and spinal regions, and blurred films produce confusion. Roentgenograms should be taken from different angles and not be limited to the classic posteroanterior and lateral views. If doubts exist, laminagrams should be requested and sedation administered to the patient if necessary. The third common reason is the focus of attention on the more prominent facial fractures. Unfortunately this is very common and a thorough clinical and general roentgenographic examination should be performed regardless of how evident the condition seems.

There are three schools of thought today for the most effective treatment of this fracture.

One is that nothing should be done during this early period of age. The child should be observed until the later teens and if there is facial deformity then plastic reconstruction would be performed. We disagree with this attitude in general. We believe if the possibility exists to prevent facial, functional and psychic disturbances with immediate and early treatment, an attempt should be made to do so.

The second is that immediate treatment is preferred but open reduction and fixation of the fractured condyloid process by wire, intraosseous sutures, or small metallic plaques and screw appliances is also favored. Again we disagree with this method of treatment except in the rare cases when the upper fragment has been extracapsularly displaced or has fallen in the space between the inner surface of the ramus and the internal and external pterygoid muscles. Our main reason for disliking the use of this method as a routine procedure is the possible trauma to the ossification center or neighboring neurovascular and glandular structures.

The third is early immobilization of the mandible after fracture. We prefer this method. Other approaches must be used when extracapsular displacement is present.

Analyzing the reason for early immobilization, we see that anatomic factors contribute to the splint-like action of the mandible. As is seen in Figure 2, these are the anterior surface of the glenoid fossa, the capsule of the temporomandibular joint and the temporomandibular ligament. During this position of immobilization the external pterygoid muscle stays inactive and loses the inward lateral pulling of the upper fragment. We have observed also in

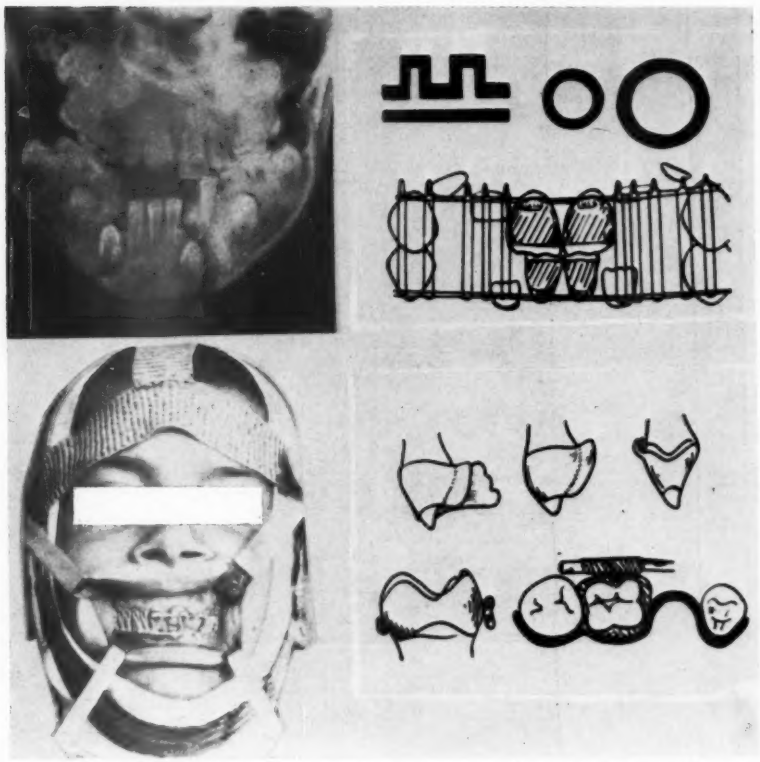


FIG. 4. These photographs and diagrams demonstrate an earlier method advocated by the first author for immobilization of the mandible and treatment of pediatric mandibular fractures. It consisted of orthodontic type of tooth bands, which in turn were fixed to arch bars. This method, although satisfactory in application, was replaced by the present method of circumferential wiring with perialveolar fixation because it was expensive and time-consuming.

roentgenographic serial studies that even when the initial position of the fragments is not ideal, after removal of the immobilizing forces and re-establishment of the temporomandibular function, nature tends to sculpture the irregular process.

It is logical then for the surgeon to help nature in her attempt to repair the mandibular condyloid fracture. A combination of technics is used, namely, circumferential and perialveolar wiring. The circumferential wiring is commonly known for mandibular application. What is not appreciated is that the maxilla can be used in a similar manner. For descriptive purposes this can be called perialveolar wiring because the wire goes around the alveolar process of the maxilla. (Fig. 3.) When these applicators are applied together, they stabilize the arch bars. Then interelastic traction can be applied to maintain immobilization.

We stated that this method of plain immobilization is a conservative one, but as frequently happens, it is not the easiest. In dealing with persons whose teeth are inadequate as a means of retention, it must be realized that this idea of immobilization of the mandible to the maxilla is a serious technical problem.

If some of the teeth are in good condition and can be utilized, they certainly should be wired and used as auxiliary means for stability of the arch bars.

The Roger Anderson pin technic and its variations, Kirschner's wires, and similar blind methods used for immobilization, being traumatic to the crowded, permanent teeth buds and facial bones, are undesirable to us. An

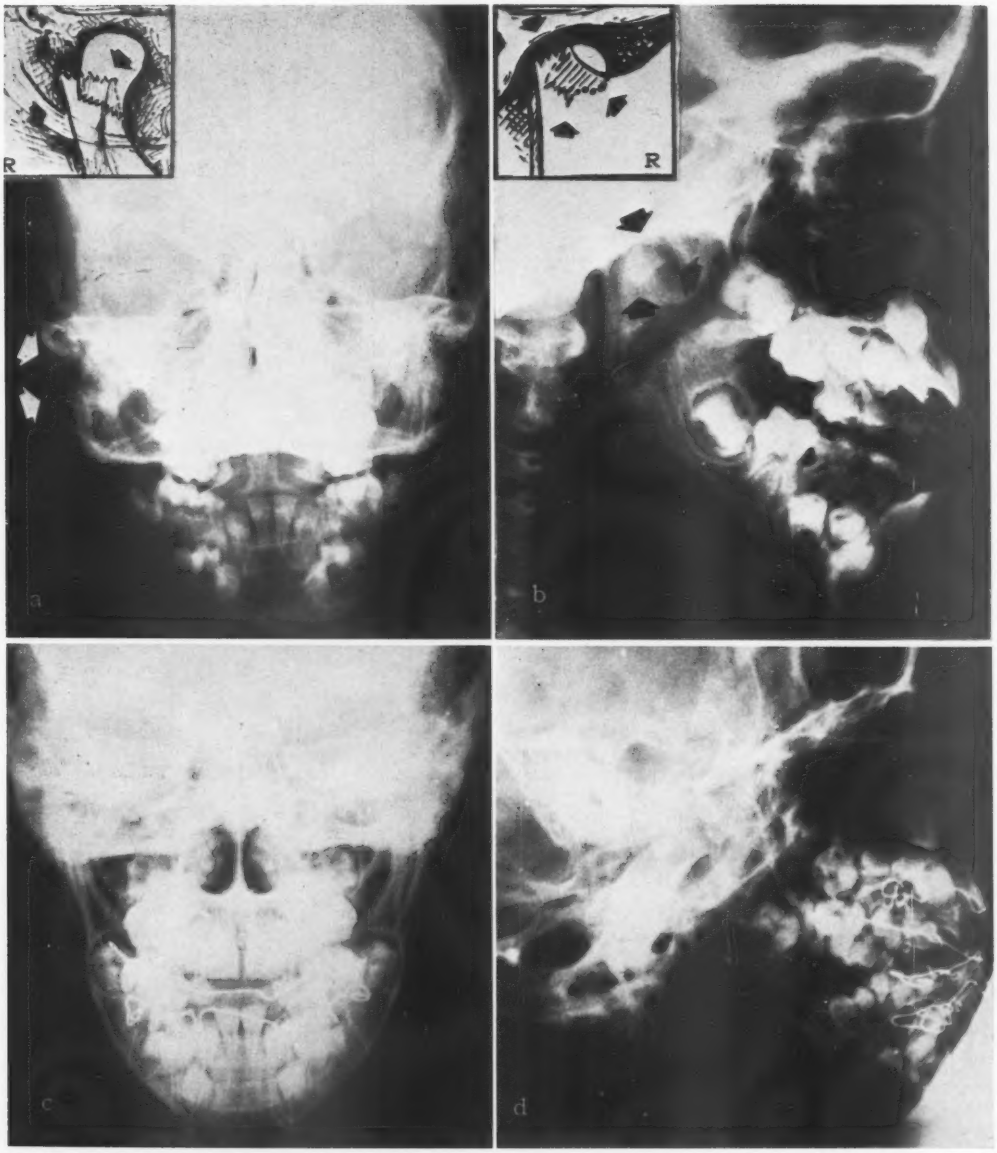


FIG. 5. Case 1. A and B, Posteroanterior and right lateral roentgenograms revealing the fracture of the right condyloid process. C and D, immediate postoperative roentgenograms.

earlier method advocated by one of us and others consisted of orthodontic type of tooth bands which in turn were fixed to arch bars as shown in Figure 4. The present method of circumferential wiring with perialveolar fixation eliminates this time-consuming and expensive method. It is desirable, however, to have dental background for application of dental appliances. Recently there is an undesirable trend to ignore the importance of the function of the dental structures themselves.

The following case reports concerning three

FIG. 5. E, shows the extraoral support by a Barton's bandage for one week. F, intraoral photograph which shows the arch bars and the elastic immobilizing forces. The two central incisor teeth have not yet erupted.

selected patients of preschool age present different characteristics and demonstrate most of the aforementioned problems.

CASE REPORTS

CASE I. This five and a half year old girl fell from a swing in a playground. Clinical examination revealed that blood in the ear was due to trauma of the anteroinferior wall of the right external auditory meatus. Other findings were pain on opening the mouth referred to the right temporomandibular joint and moderate edema of the right side of the face and submaxillary area. The right condyloid process could not be palpated with the index fingers during examination of the temporomandibular joint regions. At that time movements of the mandible were also observed. There was no pain on palpation or pressure of this area. Another finding was displacement of the mandibular midline to the right. Roentgenograms revealed a fracture of the right condyloid process as demonstrated in Figures 5A and B.

Three days later, with the patient under general anesthesia, reduction was performed by the aforementioned method as shown in Figures 5C, D, E and F. Immediate postoperative roentgenograms revealed that there was still some displacement and inward indentation of the condyloid process. The last roentgenograms, including laminagrams, taken six months after reduction revealed a much improved position of the fragment and a perfect union, as seen in Figures 5G and H. Clinically the child had good function and normal occlusion. (Figs. 5I, J and K.)

CASE II. A five year old boy fell with his bicycle and sustained an injury to the chin. He was admitted to a hospital for care and observation of a small submental laceration. In routine roentgenographic studies of the skull and facial bones, a fracture of the right condyloid process was found

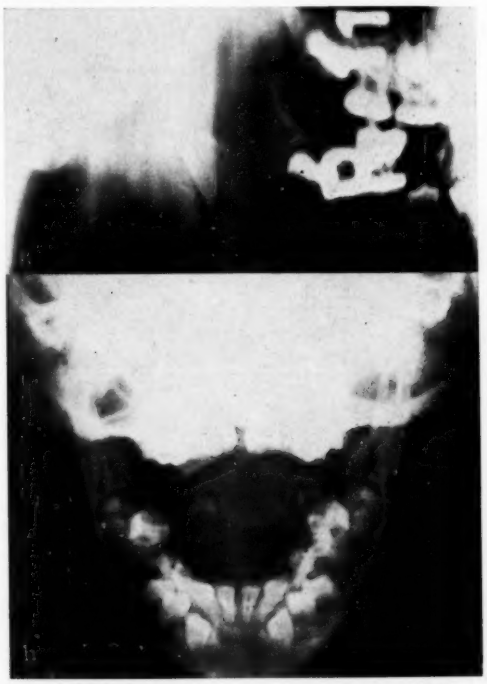


FIG. 5. G, right laminagram of the temporomandibular area taken six months later reveals very satisfactory healing and restoration of the right condyloid process. H, posteroanterior roentgenogram showing relationships with the mouth open.

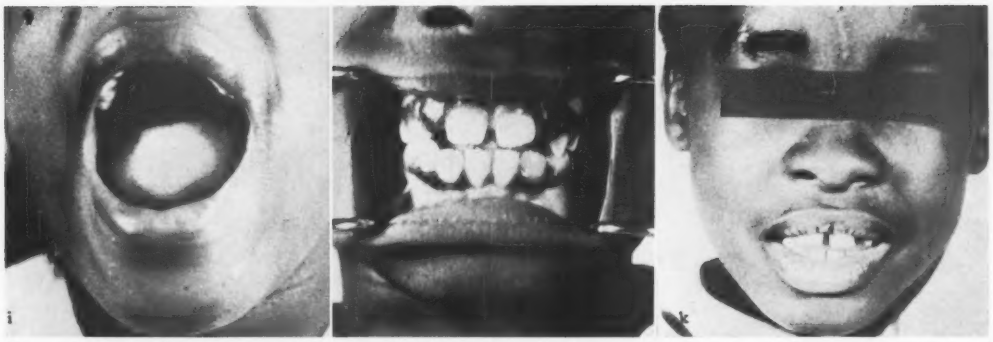


FIG. 5. I, the opening of the mouth is normal. J, the occlusion is also normal and the two half-erupted upper central incisor teeth reveal a perfect midline. K, photograph taken at that time demonstrating general facial relationships.

FIG. 6. Case II. A, B and C, preoperative roentgenograms which reveal fracture of the right condyloid process.

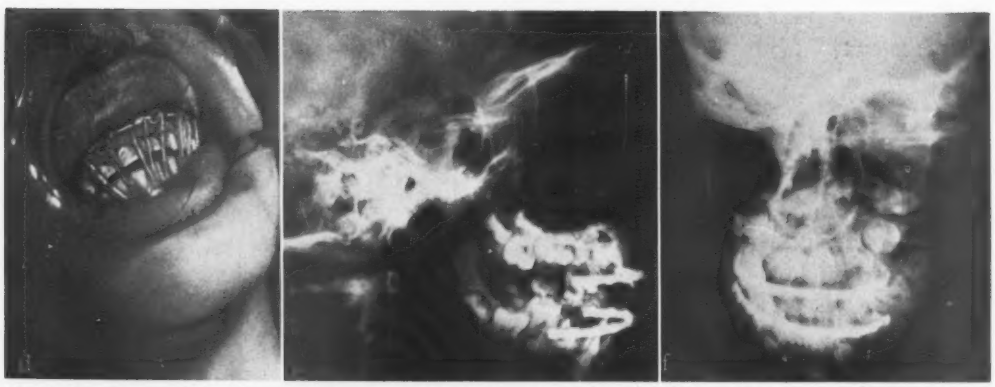


FIG. 6. D, postoperative photograph showing the applied method of immobilization. The open bite of the anterior upper deciduous teeth is due to the patient's thumb-sucking habit. E and F, immediate postoperative roentgenograms.

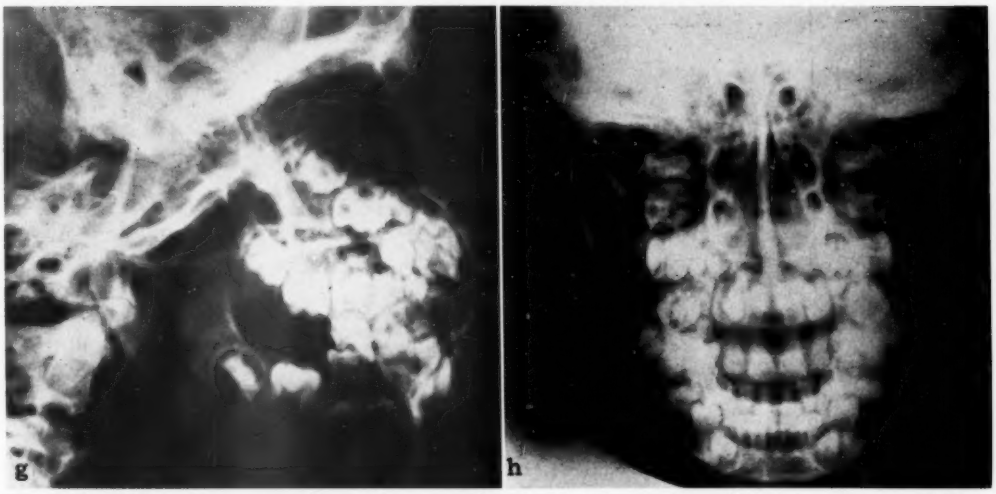


FIG. 6. G and H, roentgenogram taken on the twenty-first postoperative day immediately after the removal of the immobilizing forces.

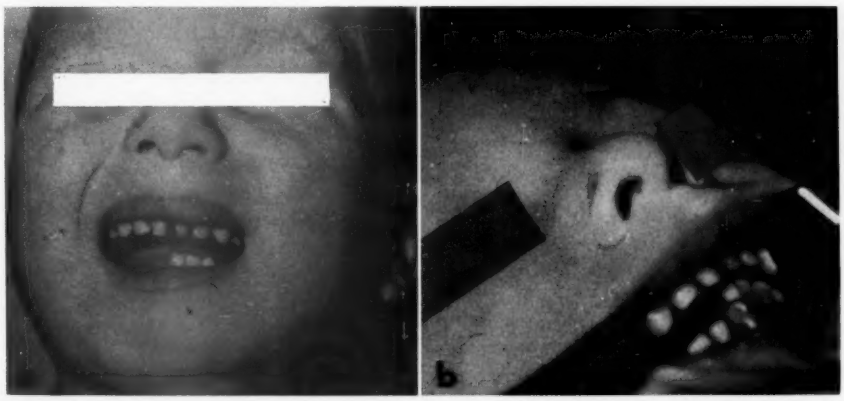


FIG. 7. Case III. A, preoperative photograph which shows inability of the patient to open the mouth more than 2 cm. wide and ecchymosis and moderate edema of the submental and left submaxillary area. The occlusal line of the lower teeth is considerably disturbed. Also, almost all the deciduous teeth are decayed. B, the same oral findings and demonstrations of the compound comminuted mandibular fracture of the midline.

with moderate inward and forward displacement as in Case I. (Figs. 6A, B and C.) The importance of this case is that this fracture could have escaped diagnosis if roentgenograms had not been taken, because during the clinical examination there were no evident findings. There was no pain on opening the mouth, on pressure of the temporomandibular region, or displacement of the midline. The occlusion showed protrusion of upper anterior teeth and premaxilla as well as an open bite due to the patient's thumb-sucking habit. Even on examination with the index finger during mandibular movements, we could not be certain of evident dysfunction of the process.

On the fourth day after the accident, with the patient under general anesthesia, reduction was performed as in Case I. (Figs. 6D, E and F.) Immobilization was maintained for twenty-one days. (Figs. 6G and H.)

CASE III. A four year old boy was riding with his parents in the family's car when an accident happened. The child struck his face.

Physical examination revealed a compound

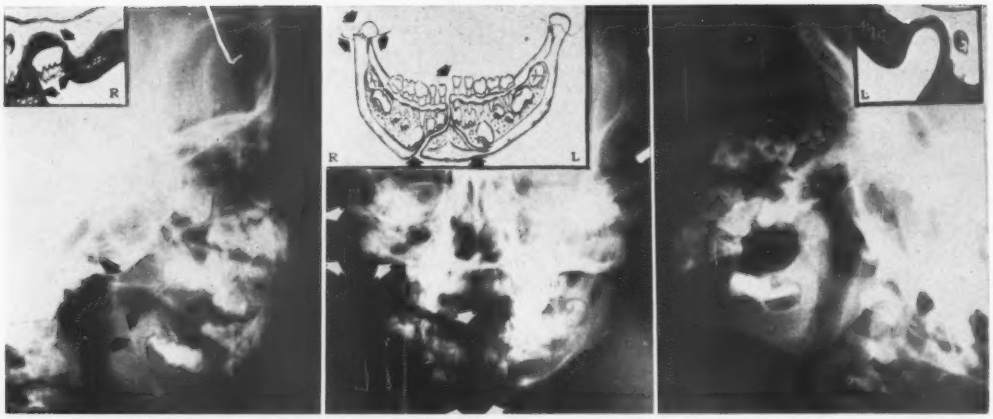
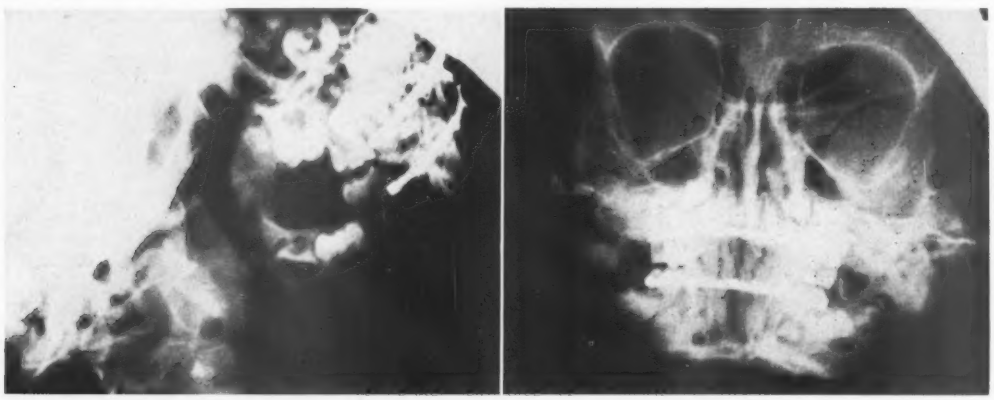
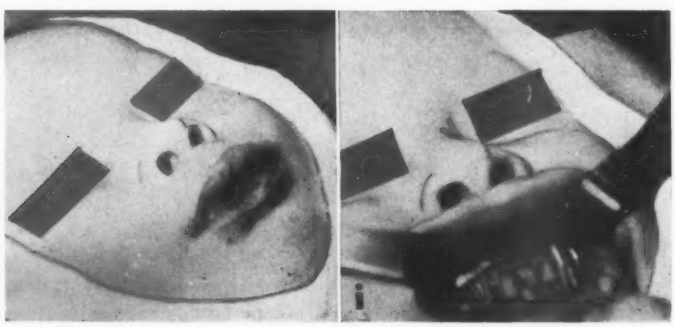


FIG. 7. Case III. C, D and E, posteroanterior and lateral roentgenograms revealing mandibular fractures of the midline, and right condyloid process mandibular fractures.



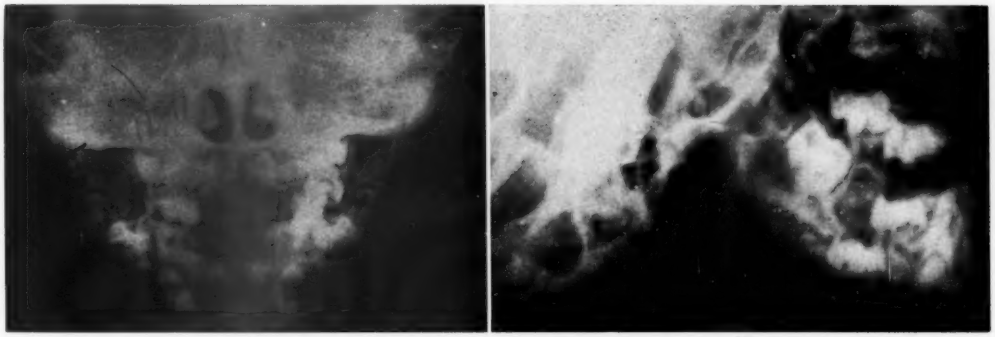
F G

FIG. 7. Case III. F and G, immediate postoperative roentgenograms.



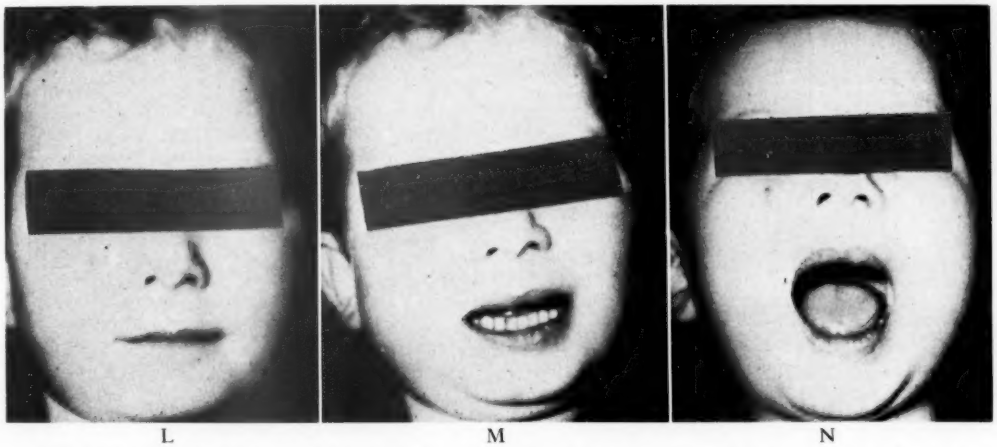
H I

FIG. 7. Case III. H and I, immediate postoperative photographs at the end of the procedure. Intraoral fixation in good occlusal relationships.



J K

FIG. 7. Case III. J and K, roentgenograms taken after the removal of immobilization, on the twenty-first day.



L M N

FIG. 7. Case III. L, M and N, clinical postoperative photographs with restored aesthetic and functional results.

comminuted mandibular fracture of the midline with marked downward displacement of the right side and upward displacement of the left, as shown in Figures 7A and B. The mouth could not be opened more than 2 cm. wide because of pain and for the same reason occlusion could not be established. Ecchymosis and moderate edema of the submental and left submaxillary area were present. The young patient was very frightened and apprehensive and did not allow any close examination. Roentgenographic studies revealed mandibular fractures of the midline and right condyloid process, as demonstrated in Figures 7C, D and E.

This also is a case in which fracture of the condyloid process could easily have escaped diagnosis. Clinical examination was inadequate; there was a definite fracture of the mandible in the midline where attention was focused and if the roentgenograms had not been good, then this important fracture could have been neglected. There is quite a difference in the treatment of a patient with mandibular fracture of the midline only and a patient with mandibular fractures of the midline and condyloid process.

On the third day after the accident, with the patient under general anesthesia, reduction of the fractures was performed as in Cases I and II. (Figs. 7F, G, H and I.) The roentgenograms and photographs (Figs. 7J, K, L, M, N, O, P and Q) show the satisfactory results.

SUMMARY

Maxillofacial fractures in children are not uncommon. The most important fracture of this kind is that of the mandibular condyloid process. Permanent deformities can develop by negligence or mistreatment.

The most desirable method of treatment is early application of circumferential wiring of the mandible and perialveolar wiring of the maxilla. Interelastic traction is used for further fixation. This combination of methods serves to

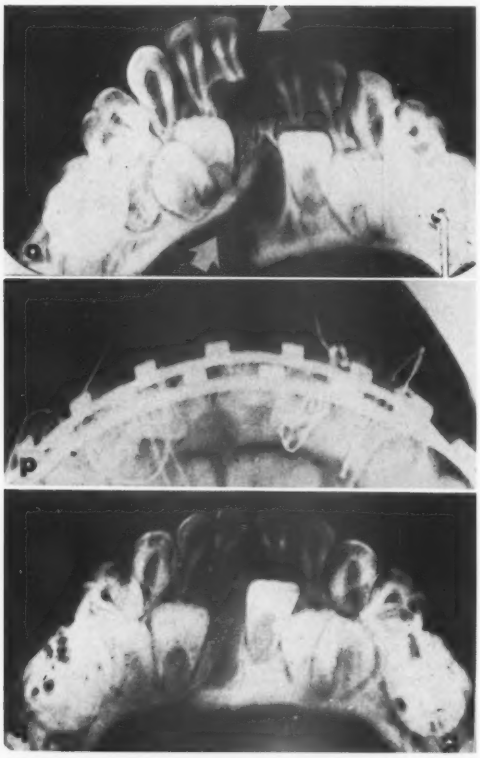


FIG. 7. Case III. O, P and Q, three stages of the midline fracture demonstrated by special roentgenographic study.

immobilize the mandible to the maxilla, helping to splint the fracture during the natural process of repair. During an average of three weeks of immobilization which is sufficient for union, close observation and care of the young patient should be applied. Postanesthesia complications and later nutritional and other disturbances can be avoided if close observation is utilized.

Finally, the surgeon who attempts to manage fractures in children must approach the treatment of the fearful or perhaps hysterical child with sympathy and understanding.

REFERENCES

1. ATTERBURY, R. and PANAGOPOULOS, A. P. Treatment of a compound multiple mandibular fracture of a three-year-old patient. *Oral Surg.*, 12: 421, 1959.
2. ENGEL, M. and BRODIE, A. Condylar growth and mandibular deformities. *Surgery*, 22: 976, 1947.
3. GEORGIADE, N. C. and PICKRELL, K. L. Treatment of maxillofacial injuries in children. *J. Internat. Coll. Surgeons*, 27: 640, 1957.
4. LEWIS, G. K. Fractures of the upper and lower jaws. *J. Internat. Coll. Surgeons*, 27: 305, 1957.
5. LEWIS, G. K. The fractured mandible. *J. Oral Surg.*, 8: 95, 1950.
6. PANAGOPOULOS, A. P. Physical treatment of trismus and partial ankylosis of the temporomandibular joint. *J. Oral Surg.*, 10: 36, 1952.
7. PANAGOPOULOS, A. P. and DIETRICH, W. C. Anesthesia in operative procedures on fractures of children's jaws. *Dent. Items of Interest*, 1953.
8. PANAGOPOULOS, A. P. and ELFENBAUM, B. A. Nutritional needs in fractures of jaws in children and healing processes. *Oral Surg.*, 9: 578, 1956.
9. PANAGOPOULOS, A. P. Management of fractures of the jaws in children. *J. Internat. Coll. Surgeons*, 28: 806, 1957.
10. PANAGOPOULOS, A. P. Circumferential wiring as an aid to the management of maxillofacial fractures. *J. Internat. Coll. Surgeons*, 32: 405, 1959.
11. REITER, E. Multiple fractures of the mandible in a child. *J. Oral Surg.*, 6: 87, 1948.
12. SADOVE, M. S. Anesthetic management for maxillofacial surgery. *Illinois M. J.*, 110: 5, 1956.
13. STUTEVILLE, O. H. and LANFRANCHI, R. P. Surgical reconstruction of the temporomandibular joint. *Am. J. Surg.*, 90: 940, 1955.
14. STUTEVILLE, O. H. The surgical treatment of acute injuries to the soft tissues and bony structures of the face. *Am. J. Surg.*, 92: 864, 1956.

New Onlay-Inlay Metal Splint for Immobilization of Mandibular Subcondylar Fractures

REPORT OF TWENTY-SIX CASES

MARSH ROBINSON, D.D.S., M.D. AND CHARLES YOON, D.D.S., *Los Angeles, California*

From the University of Southern California School of Dentistry, Los Angeles, California. This investigation was supported in part by Grants D-666 and DT-34 from the National Institute of Dental Research, U. S. Public Health Service.

THE results of immobilization of mandibular subcondylar fractures utilizing a new onlay-inlay metal bone splint is discussed herein. Since the first use of this plate on December 3, 1956, twenty-seven have been used in twenty-six patients on the Oral Surgery Service of the University of Southern California [1]. We believe that mandibular subcondylar fractures should be repaired by an open operation when they are displaced and that the fragments should be replaced in their original position. Every effort should be made to preserve the blood supply to the condylar fragment during surgery and it should be adequately immobilized. The indication for an open procedure is not the subject of this paper. Comments will be made on the advantages of this new design over that of other metal bone plates [2], interosseous wires, or metal pins [3]. The results of inadequate immobilization are shortening of the mandibular ramus and a progressive deterioration of the masticatory organ. It is believed that this new splint will prevent malocclusion, early loss of teeth, pain in the opposite joint from unilateral chewing and deviation of the chin. With its two screws it can be placed through a submandibular approach thus avoiding injury to the facial nerve which is possible when the preauricular approach is used.

All metal in the splints, screws and drills is No. 316 stainless steel. The onlay-inlay splints are "L" shaped in cross section and the onlay side is 4 mm. wide. The inlay portion to be placed in the groove is 2 mm. deep. The onlay portion of the splint is perforated so that screws can be placed in alternate holes. Splints range in length from 12.7 mm. to 23.7 mm., or from four holes to eight holes. The screws are of a flat hexagon-headed type with a small body and a deep loose thread. These self-tapping screws are from 6.5 to 9.5 mm. in length. A special bone drill is also made of No. 316 stainless steel and has the same diameter as the body of the screw. A special hexagon-headed wrench is needed to place the screws.

METHOD

Maxillary and mandibular arch bars are placed, and the occlusion manually established and fixed with intermaxillary wires. The open reduction and application of the plate is delayed approximately one to two weeks. An adequate roentgenographic study is made during this period and other injuries which may influence the treatment plan are evaluated. This delay allows for resolution of local swelling of soft tissue.

Surgery. Nasotracheal anesthesia is used. The anesthetist inserts a Levin tube to keep the stomach empty until the patient is fully awake. In a wrinkle line, the incision site is outlined with a skin stain approximately 6 cm. in length and 1 cm. below the angle.

Supplemental local anesthesia is given for hemostasis. The skin, subcutaneous tissue, and the platysma muscle are incised. Beneath the platysma muscle the tissues are bluntly divided, and the mandibular branch of the facial nerve identified with a nerve stimulator and retracted

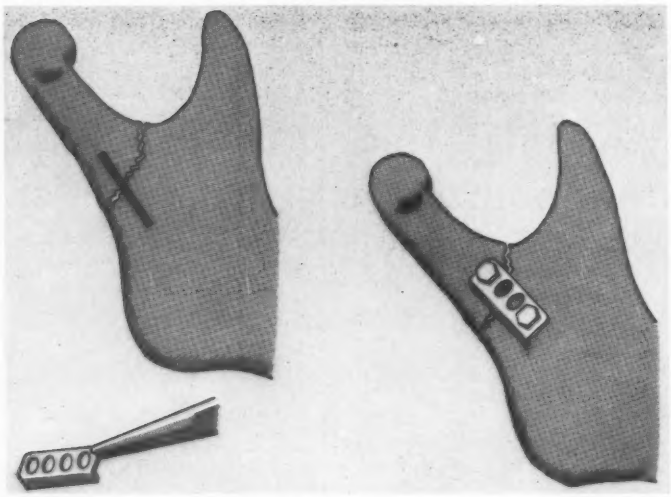


FIG. 1. *Left*, schematic drawing of reduced subcondylar fracture with groove made through lateral cortical plate to receive small right angle flange of new onlay-inlay type plate. Mosquito hemostat holds the new stainless steel bone plate by the flat onlay part. *Right*, schematic drawing of plate (enlarged) fitted into groove and fixed with two screws. The inlayed part of the splint will resist the displacing force of the external pterygoid muscle leaving the screws free of stress.

superiorly. The periosteum is incised at the lower border of the ramus, and elevated from the lateral surface of the ramus superiorly until the mandibular notch and fracture site are identified. A hole is then drilled in the angle of the jaw and a .020 inch stainless steel wire is placed temporarily for downward traction. The condylar fragment is manually reduced and a Dingman bone forcep is used to temporarily immobilize the fragments. An onlay-inlay metal splint of the proper length is selected. A groove (Fig. 1, left) is then made through the lateral cortical plate across the fracture site under a constant stream of saline solution with a No. 701 dental burr. The inlay portion of the splint is then placed in this groove and the bone forceps adjusted to hold both fragments and plate. Two pilot holes are then drilled under a constant stream of normal saline solution, one in each fragment. Two self-tapping stainless steel screws are then inserted (Fig. 1, right). The wound is temporarily closed, and work on the mouth begins. The teeth are placed in normal occlusion and fixed with three or four intermaxillary wires. The patient is draped again and the position of the plated fracture is inspected. Closure of the wound is then performed in the usual manner and a bandage is applied.

Postoperative Care. Postoperative care is the same as for other patients after an open reduction. The intermaxillary wires are adjusted weekly and removed after six weeks.

COMMENTS

Twenty-seven of the new onlay-inlay metal splints have been used to immobilize mandibular subcondylar fractures in twenty-six patients. One operation was performed in 1956, four in 1957, twelve in 1958, seven in 1959, and two in 1960. Of these twenty-six patients, twenty-two were operated upon by residents in the University of Southern California Oral Surgery Service at the Los Angeles County Hospital. Four patients were operated in a private hospital. There were twenty-two men and four women. Their ages ranged from nine to forty-nine years. The fractures were caused by automobile accidents in five instances, by a fall in four instances, by a fist in fourteen patients, and three miscellaneous causes. The displaced subcondylar fracture was the only fracture in fourteen cases. Twelve patients had other fractures of the mandible. In one case

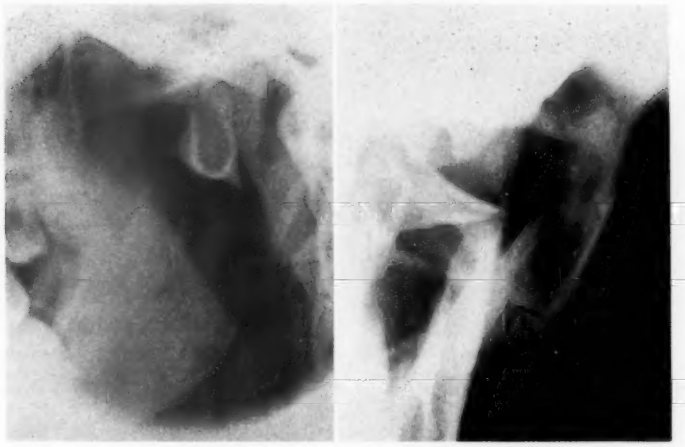


FIG. 2. Preoperative roentgenograms taken October 22, 1958. *Left*, lateral view; *right*, anterioposterior view. Note that the right condylar fragment has been displaced approximately 90° medially.

bilateral subcondylar fractures were immobilized with the new plate. The time from the accident to the time of surgery varied from 3 to 37 days, with an average of 13.7 days. Postoperatively, all patients had intermaxillary fixation with the exception of three patients; two were edentulous and one had severe epilepsy.

The following patients were selected to illustrate the various factors encountered in subcondylar fracture immobilization.

An eighteen year old white male student, was injured in an automobile accident on October 11, 1958. He sustained a right subcondylar fracture approximately 1 cm. below the anatomic neck. The entire fragment was dislocated about 90° medially from the mandibular fossa. (Fig. 2.) The patient had a right unilateral open bite type of malocclusion (Fig. 3A.) There was no other injury to his mandible. On October 23, 1958 reduction and immobilization of this fracture were performed in the manner previously described. On December 3, 1958, the intermaxillary wires were removed. The patient recovered uneventfully. He was last seen on March 5, 1960 (Fig. 3B), at which time he had no complaints. His occlusion was good (Fig. 3C), and the jaw opened 4 cm. in the midline. (Fig. 3D.) There was no joint tenderness or crepitus. Roentgenographs showed good position and healing. (Fig. 4.)

A forty-six year old white man was struck and robbed on April 24, 1959. The blow resulted in a fracture dislocation of the right condyle and a fracture of the body of the left mandible. The patient was edentulous. On May 15, 1959, both fractures were plated using the new onlay-inlay splint. No intermaxillary fixation was used. The patient was last seen on March 12, 1960. He had no complaints. Physical examination revealed no abnormalities. He was successfully wearing the artificial dentures which he had worn before the fracture occurred. Roentgenograms showed normal healing of the fractures. This case illustrates that the new onlay-inlay metal bone plate for immobilizing subcondylar fractures is adequate even though intermaxillary fixation is not used.

The third patient, a nine year old white boy, was injured in a fall from his bicycle on May 3, 1958. He had a subcondylar fracture of the left mandible 1 cm. below the head of the condyle. The fragment was dislocated 90° medially. A unilateral retruded open bite was present. No other fractures of the mandible were found. Consent was obtained from the parents for surgery [4]. On May 12, 1958, the new onlay-inlay plate was used to immobilize the reduced subcondylar fracture. The intermaxillary wires were removed after four and a half weeks, and the jaw opened adequately in the midline. There was no evidence of loss of growth or development. He had no complaints, and the occlusion was good. He was last seen on Febru-

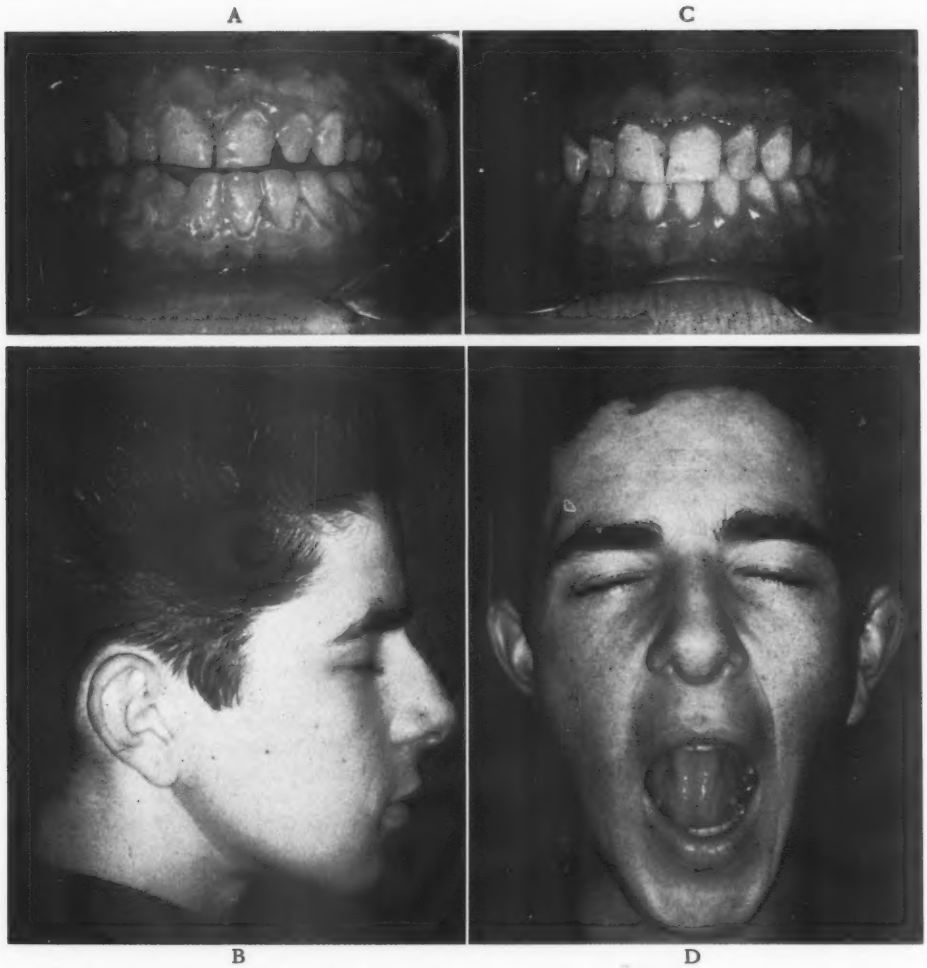


FIG. 3. A, preoperative photograph of patient's occlusion taken October 2, 1958. Notice the anterior open bite malocclusion due to right subcondylar displaced fracture. B, right lateral profile view of patient postoperatively. Note the scar from the submandibular approach hidden in a wrinkle line. C, postoperative photograph of patient's occlusion taken March 5, 1960. D, postoperative photograph of patient taken one and a half years after surgery showing adequate opening in the midline and no damage to the facial nerve.

ary 24, 1960. Roentgenograms showed good position and healing.

An eighteen year old white girl fell during an epileptic seizure on October 23, 1959. She received a subcondylar fracture on the right side with the condyle displaced approximately 90° anteriorly and medially. The patient's personal physician would not allow intermaxillary fixation to be used as the epileptic seizures were not controllable by medication. On October 29, 1959, the right subcondylar fracture was reduced and immobilized in the manner described above. No intermaxillary fixation was used. The patient made an uneventful recovery. She was last seen on March 5, 1960. She had no complaints, her occlusion was good, and the postoperative roentgenograms showed the fragments in good position with normal healing.

Our cases have been followed for a maximum of two and a half years and a minimum of six weeks. All roentgenograms exhibited evidence of good reduction and immobilization. There

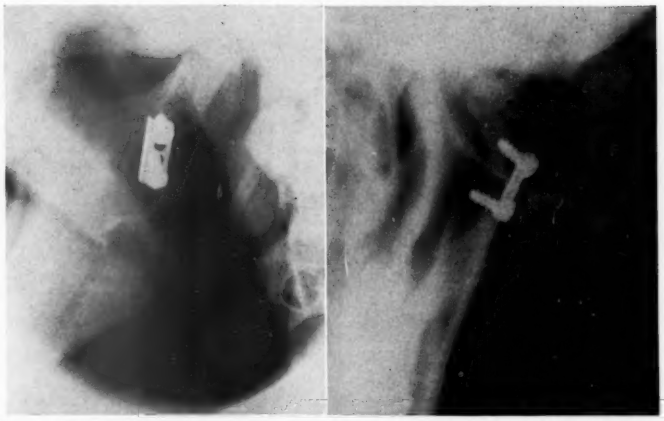


FIG. 4. Postoperative roentgenograms taken March 5, 1960. *Left*, lateral view; *right*, anterioposterior view. Note adequate immobilization and normal healing with new onlay-inlay bone splint.

were no instances of permanent damage to the mandibular branch of the facial nerve. After the immediate postoperative period there were no instances of pain in the joint. One patient exhibited malocclusion but stated that this was present before his injury. One patient (the third) had crepitus in the affected joint and minimal tenderness in this area. One patient had deviation on opening the mouth. None of the patients had any limitation of opening after the immediate postoperative period. The only growing child (the third patient) in this series has been followed up for two years and exhibits no abnormality of growth or development.

A bone plate should be used in those cases in which intermaxillary fixation is impossible or questionable in the postoperative period. A plate is also indicated in many multiple fractures of the mandible as it affords greater stabilization than an interosseous wire. This new splint has only two bone screws while former available plates have required three or more [5,6]. The anterior component force of the external pterygoid muscle is borne by the inlayed portion of the splint in the dense cortical groove leaving the screws free of stress. This is not true of the other available splint designs. In the cast type of splint the metal is bulky and brittle. It cannot be bent to final contour at the time of surgery. If an individually designed malleable stainless steel plate is used, it is most difficult to fabricate [7]. The intermedullary pin is not applicable to this area in which the condylar neck has virtually no medullary bone. The authors believe that past failure of immobilization has been a deterrant to open reduction.

SUMMARY

A new onlay-inlay metal bone splint for the immobilization of subcondylar fractures is discussed. It has been used twenty-seven times in twenty-six patients. A follow up of these twenty-six patients is presented. The advantage of this splint over older methods of immobilization is considered. Four selected patients illustrate the problem.

REFERENCES

1. ROBINSON, M. Immobilization of subcondylar fractures after open reduction. *J. South. California Dent. A.*, 26: 330, 1958.
2. THOMA, K. H. Oral Surgery, 3rd ed. St. Louis, 1958. C. V. Mosby Co.
3. STEPHENSON, K. L. and GRAHAM, W. C. The use of the Kirschner pin in fractures of the condyle. *Plast. & Reconstruct. Surg.*, 10: 19, 1952.
4. ROBINSON, M. Intelligent consent for treating subcondylar fractures in children. *J. Oral Surg.*, 17: 46, 1959.
5. STUTEVILLE, O. and JARABAK, J. R. Condylar plating for the reduction of condylar fracture. *J. Dent. Res.*, 31: 515, 1952.
6. GIAMMUSSO, A. P. and JOHNSON, W. B. Management of a subcondylar fracture. *J. Oral Surg.*, 17: 67, 1959.
7. SMITH, A. E. and ROBINSON, M. Stainless steel bone onlay splints for the immobilization of displaced condylar fractures. *J. Oral Surg.*, 15: 164, 1957.

Traumatic Mandibular Condylar Fracture Dislocations

EFFECT ON GROWTH IN THE MACACA RHESUS MONKEY

ROBERT V. WALKER, D.D.S., *Dallas, Texas*

Department of Surgery, Division of Oral Surgery, The University of Texas Southwestern Medical School and the Department of Oral Surgery, Baylor University College of Dentistry. *This investigation was supported in part by a research grant (D-427) from the National Institutes of Health, U. S. Public Health Service.*

A THOROUGH understanding of the potential for continued mandibular growth following traumatic fracture dislocations of the condyle in the young child is a requisite for anyone concerned with management of this type injury. Complete and general accord as to proper management of such injuries is obviously lacking as evidenced by the conservative and the radical surgical methods advocated by proponents of the two diametrically opposed plans of treatment.

There is little need to review the various growth areas of the mandible for they are well documented and reported. It is generally conceded that perhaps the primary growth center is located at the epiphyseal-like cartilaginous cap of the condyle with the second most important site being along the posterior border of the ramus where appositional growth occurs [1,2]. Damage to these areas or displacement of the condyle from its normal alignment and position is the situation considered most likely to be productive of growth changes if, indeed, they occur at all.

In this institution treatment of the young child with fracture dislocations of the mandibular condyles has been managed both conservatively and surgically with no real assurance that either approach was the optimal to be offered in the given circumstance. Because of this continual lack of certainty as to the rationale for our own methods, it was elected to observe what would occur over a long postoperative period with similar types of fractures produced in the young macaca rhesus monkey and treated by the two means, conservative and surgical.

MATERIAL AND METHODS

Nine young macaca rhesus monkeys obtained from the Dallas municipal zoo were utilized in the original pilot study. No record of the animals' ages was obtainable but they were all young animals as determined by their prevailing deciduous dentition and their weight which varied between 1.36 kg. (the smallest) and 1.81 kg. (the largest). All had complete deciduous dentitions with what would be considered a normal occlusion when the project began.

The animals were anesthetized by administering a 0.5 per cent solution of pentobarbital sodium intravenously and titrating them with this drug as required during surgery. The total dose of the intravenous barbituate per animal varied between 45 and 60 mg.

Each animal operated was shaved on the involved side posterior to the ear, around the ear, from the cervical area upward above the zygomatic arches and forward to the eye, nose and commissure of the mouth. The shaved areas were prepared with pHisoHex® and water and draped with the prepared areas exposed. A submandibular approach, comparable to that described by Risdon [3], was made in each animal operated upon. Discrete operative dissections were carried out with preservation of the mandibular and cervical branches of the facial nerve. The attachment of the masseter muscle at the inferior border and angle of the

FIG. 1. A, immediate postoperative anteroposterior roentgenogram of monkey A showing the bilateral fracture dislocation and displacement of the condylar heads. B, anteroposterior roentgenogram made eighteen months later at the time monkey A was killed depicting the poorest reformation of the condylar heads which occurred in the study. Rather bizarre modeling, contouring and resorption has occurred. C, posterior views of the mandibles of monkey A and the control animal showing the differences in over-all posterior mandibular morphology of the two animals. The marked curling inward of the angles and lack of total height from the tip of the condyle to the horizontal plane of the mandibular inferior border is noted in monkey A. The roughened and incompletely resorbed portion of the old left condyle is also noted at the medial pole of the left condyle in monkey A. A relative increase in height of the coronoid processes is likewise evident.

mandible was incised sharply and the periosteum elevated superiorly. The temporomandibular joint was approached from along the ramus of the mandible. Upon visualization of the articular area, the condylar neck was sectioned with a No. 700 cross-cut fissure bur operated in a sterile dental handpiece run under a constant stream of cool saline. The cut extended slightly inferior from the depth of the sigmoid notch and thence to the posterior border of the mandible. A sterile blunt punch was used to forcibly dislocate the condyle in a medial and anterior direction with the cut surfaces of the bone coming to rest at right angles to each other or with the condyle anteriorly and just opposite the area of the sigmoid notch. In those animals destined to be treated by the "conservative" method the condyles were left in this position. Those animals to be treated "surgically" had the condyle placed in anatomic position and alignment, and a hole was drilled through the condylar neck and ramus near the

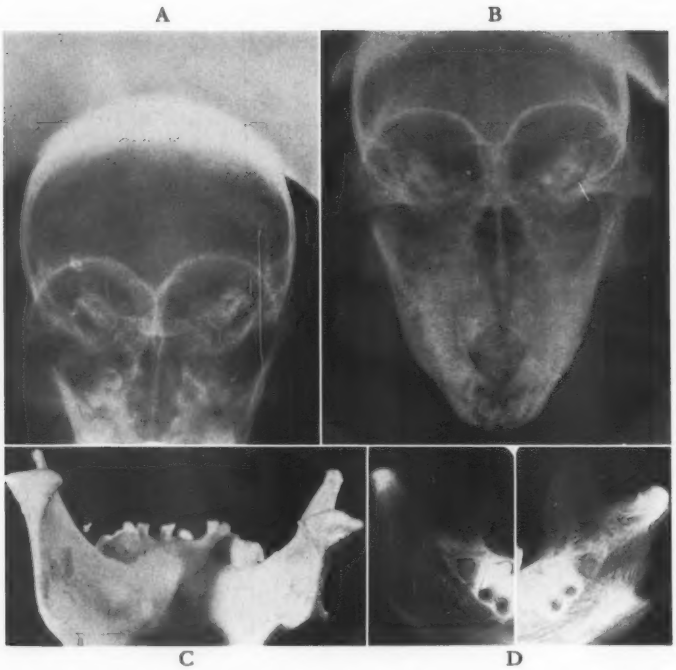


FIG. 2. A, immediate postoperative anteroposterior roentgenogram of monkey B showing the right unilateral condylar fracture dislocation and displacement. B, anteroposterior roentgenogram made eighteen months later at the time monkey B was killed showing complete reformation of the right condyle. C, posterior view of the mandible of monkey B showing altered morphology on the right compared to the untraumatized left and the form of the newly made condyle on the right. A small fin of resorbing bone at the medial pole of the right condyle is also evident. D, roentgenograms of the right and left rami of monkey B.

"fracture area." A No. 28 stainless steel wire was threaded through these two holes and twisted tight to serve as an aid to fixation of the condyle in its normal position. Closure of the operative wounds was accomplished by careful surgical technics with the masseter muscle being secured in its normal position by suturing its fascia to the periosteum at the angle and inferior border of the mandible. Closure then proceeded in layer fashion with the incised skin edges being retained by No. 4–0 interrupted silk sutures.

Immobilization of the mandible in the first animal operated upon was accomplished by placing a circumferential stainless steel wire in the region of the mandibular symphysis and a peralveolar* wire in the midline of the maxilla; the two wires were secured tightly after the teeth had been placed in firm occlusion. Feeding and maintaining the animal postoperatively proved particularly tedious and time consuming. This problem has been solved for current work on the simian jaw with the acquisition of special feeding and restraining table perches which greatly facilitates handling these animals for this type of work. The remaining animals' mandibles were not immobilized postoperatively.

The animals were maintained from sixteen and a half to twenty months following surgery. The one control animal was sacrificed twenty months following operation on the last experimental animal. Weight of the operated animals at the time they were killed varied between 6 pounds and 7.4 pounds. The control and oldest

* Peralveolar wire is wiring through the alveolar process itself, usually of the maxilla. (Rowe and Killey [6].)

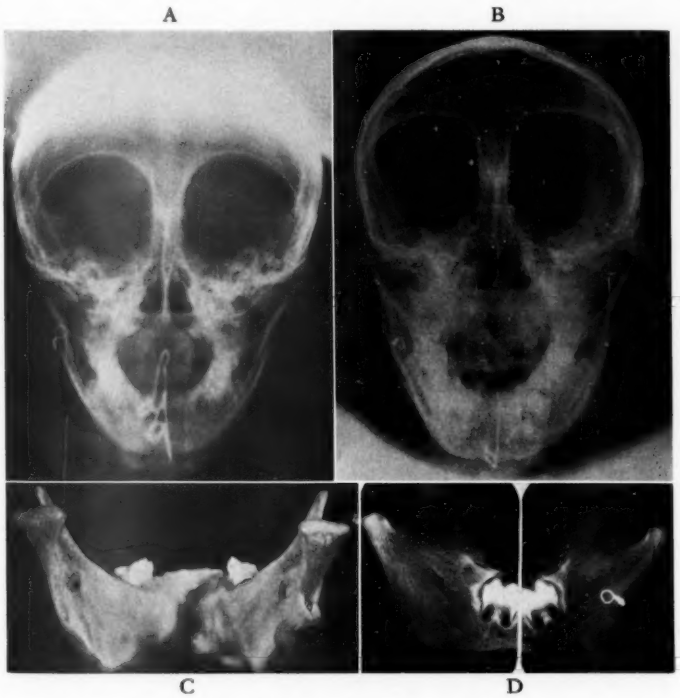


FIG. 3. A, immediate postoperative anteroposterior roentgenogram of monkey C showing the fractured right condyle fixed in position with one transosseous wire and the mandible immobilized with a mandibular circumferential wire and a maxillary peralveolar wire ligated together. B, anteroposterior roentgenogram made seventeen months later at the time monkey C was killed showing the normal position of the condyle and growth of the mandible as confirmed by the downward and anterior movement of the transosseous wire. A portion of the original mandibular circumferential wire remains. C, posterior view of the mandible of monkey C showing relatively normal symmetry and height. The pronounced medial curling of the angle seen in other animals not noted here and probably obviated by short period of jaw immobilization enabling the masseter to reattach. D, roentgenograms of the right and left rami of monkey C; comparable size and morphology maintained in this animal.

animal in the group weighed 8.2 pounds when sacrificed.

Anteroposterior radiographs of the animals' condylar areas were taken preoperatively, immediately postoperatively, and at the time they were killed. These views were of a modified anteroposterior technic to insure the projection of the condyles to a point clear of the base of the skull and the heavy postglenoid lip of the articular fossa found in the macaca rhesus monkey. Technical factors included projection of the central ray through the bridge of the animals' noses at a plus 22 to 25 degree angulation above the horizontal. Target to film distance was 18 inches. Blue Brand regular film in a cardboard casette was exposed for two-fifths second at 70 KVP, 10 milliampere seconds.

At the time of sacrifice the animals' heads were excised from the body and kept in a water bath maintained at 180°F. for forty-eight hours or until the soft tissues cleaved easily from the bone. The skulls were bleached by soaking in a weak solution of hydrogen peroxide.

Of the eight animals operated, two had bilateral fracture dislocations of the condyles produced according to the technic described with no treatment instituted. (monkeys A and H, Figs. 1 and 8.) Right and left fracture dis-

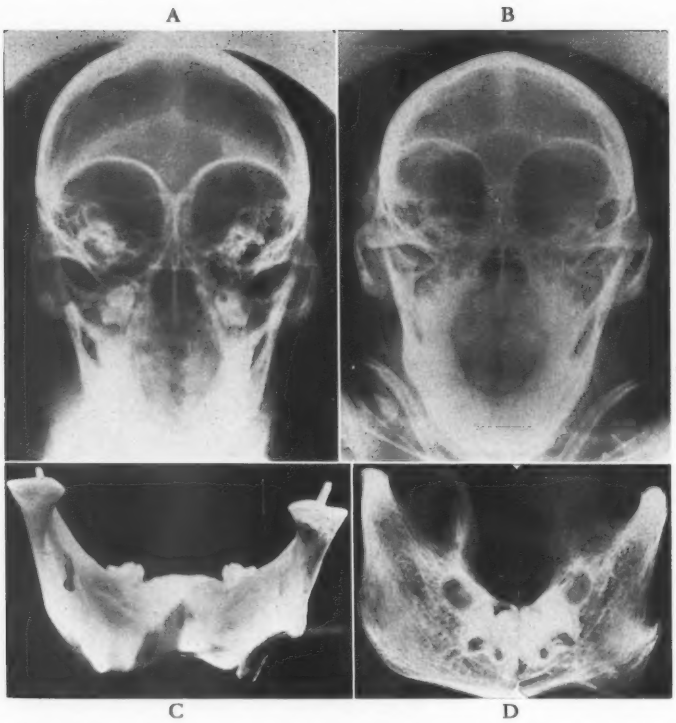


FIG. 4. A, immediate postoperative anteroposterior roentgenogram of monkey D showing the mandibular right ramus from whence the condyle has been excised. B, anteroposterior roentgenograms made eighteen months later at the time of sacrifice of monkey D showing complete condylar regeneration and reformation at the condylectomized site. C, posterior view of the mandible showing relatively normal symmetry and height. The pronounced medial curling of the right angle is evident. D, roentgenograms of the right and left rami; comparable size and morphology also maintained in this animal. Greater notching is noted along the right inferior border anterior to the angle and also loss of appositional growth along the posterior border. The height from the tip of the condyle to the horizontal plane of the inferior border is actually 1 mm. greater on the right than on the left.

locations were produced in one with the condyles being replaced and maintained in normal position with a No. 28 stainless steel transosseous wire across each "fracture" line. (monkey G, Fig. 7.) One had a right condylar fracture dislocation produced with no treatment instituted. (monkey B, Fig. 2.) A right condylar fracture dislocation was produced in another with the condyle being replaced and maintained in normal position with a No. 28 stainless steel transosseous wire across the "fracture" line. (monkey C, Fig. 3.) Another had a left condylar fracture dislocation produced with no treatment instituted. (monkey F, Fig. 6.) One had fracture dislocation of the right condyle, then excision from all viable attachments (this has occurred in personal clinical situations in which the condyle was inadvertantly excised during difficult reductions), and finally replaced and maintained in normal position with a No. 28 stainless steel transosseous wire. (monkey E, Fig. 5.) The right condyle was excised in the last animal to produce the predictable type of deformity (monkey D, Figure 4) as reported by Sarnat [4] and to serve as a "control" along with the ninth and unoperated animal (Fig. 1C).

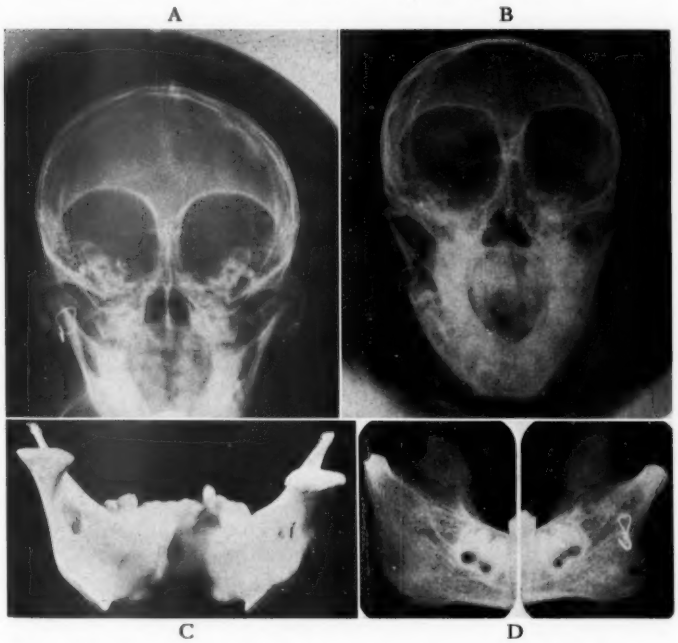


FIG. 5. A, immediate postoperative anteroposterior roentgenogram of monkey E showing the right condyle wired in position following fracture at the neck, medial dislocation, excision, and final replacement in normal alignment. B, anteroposterior roentgenogram made eighteen months later at the time monkey E was killed showing a normal position of the condyle and growth that has occurred as confirmed by the downward and anterior movement of the transosseous wire. C, posterior view of the mandible of monkey E showing relatively normal symmetry and height of the two sides. D, roentgenograms of the right and left rami of monkey E; comparable size and morphology maintained in this animal.

FINDINGS

The most striking result was the propensity of the rhesus monkey to form a workable, usable mandibular articulation following such trauma. Regardless of whether the condyle was left at a right angle to the ramus, pushed in a medial and anterior direction, or reduced and maintained in anatomic position, each mandible had formed a remarkably morphologically identifiable condyle in an upright position. The law of transformation or modeling resorption was graphically demonstrated. This does not mean that each animal fashioned a precise and perfect condyle without interruption in the growth of the ramus and body, but each animal reformed a relatively normal condylar head without undue sacrifice of mandibular symmetry and growth.

An equally graphic recording was the demonstration of the influence a muscle attachment has on molding and contouring of a growing bone. Because of the operative approach elected in this project, the masseter muscle was detached at its insertion along the ramus, angle and inferior border of the mandible. The usual reattachment technic was performed during closure of the operative wounds; in all except one animal the jaws were mobilized immediately, thereby taxing the proper healing and reattachment of the muscle during movement of the jaw. Because of such early mobilization of the jaw the masseter muscles reattached at a higher level along the ramus and in so doing left the inferior border and angle of the mandible to the contractile pull of the internal pterygoid muscle alone. The influence of functional internal pterygoid muscle contractile tension

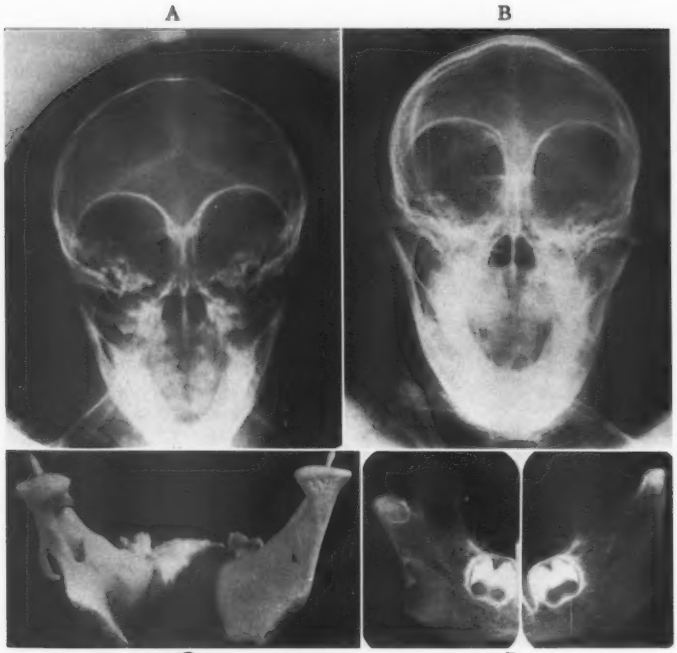


FIG. 6. A, immediate postoperative anteroposterior roentgenogram of monkey F showing the left condyle fractured and dislocated in a medial position. B, anteroposterior roentgenogram made seventeen and one half months later when monkey F was killed showing the complete reformation of the left condyle with resorption of the original medially displaced fragment. C, posterior view of the mandible of monkey F showing the altered morphology on the left compared to the untraumatized right and the form of the newly made left condyle. A small fin of resorbing bone at the medial pole of the left condyle is evident. A hooked appearing bony spur on the lateral portion of the left ramus at the posterior border lacks explanation. D, roentgenograms of the right and left rami of monkey F. Some alteration in morphology is evident, but the height from the tip of the condyle to the horizontal plane of the inferior border of the mandible is exactly the same (34 mm.) on both sides. The coronoid process is slightly longer on the left side.

alone and unopposed laterally produced a curling inward and medially of the inferior portion and angle of the mandible. (Figs. 1C, 2C, 4C, 5C, 6C, 7C and 8C.) The only animal escaping this variable was the one which had his mandible immobilized by the circumferential and peralveolar wiring technics. (Fig. 3C.) The reattaching of the masseters at a higher level produced a variety of roughened spurs and ridges along the usually smooth lower part of the ramus. (Fig. 2C, 6C, 8C.) Perhaps the reason for not observing this phenomenon more frequently after comparable clinical procedures is that all condylar surgery performed from the submandibular approach is usually followed by immobilization of the jaw which insures ample time for proper muscle reattachment as well as bone healing. This is a particularly important consideration in the young subject in whom growth is rapid and influenced by the varied stimuli to which it might be subjected.

The occlusion of each animal remained quite stable without visible shift to one side or the other. No animal developed an open bite at the incisor area.

An examination of the various dimensional differences of parts of the animals' mandibles (Fig. 9) reveals that somewhat insignificant changes had occurred in growth following the several operative maneuvers accomplished dur-

FIG. 7. A, immediate postoperative anteroposterior roentgenogram of monkey G showing the fractured right and left condyles each fixed in position with a single transosseous wire. B, anteroposterior roentgenogram made seventeen and one-half months later when monkey G was killed showing the normal position of both condyles and growth of the mandible as confirmed by the downward and anterior movement of the transosseous wires. C, posterior view of the mandible of monkey G showing somewhat altered morphology but a symmetrical form. D, roentgenograms of the right and left rami of monkey G; comparable size and morphology maintained on the two operated sides.

ing the initial study. The greatest differences were noted in the anteroposterior width of the rami comparing the operated and nonoperated sides. An essential factor influencing appositional growth along the posterior border of the ramus was violated in the trauma, for all animals exhibited emphatic lack of this facet of mandibular growth (Figs. 2 through 8D). An interesting column for examination is that related to height of the condyle measuring from the highest tip of the condyle to the horizontal plane of the inferior border of the mandible. There was little difference in this height in the unilateral cases (monkeys B, C, D, E, F), whether the condyle was left in a dislocated position or repositioned and wired, when compared with the operated side and the nonoperated control side in other animals. The minimal differences in height become even more interesting when one considers that "fracturing" and dislocating the condyles medially in the cases left untreated (monkeys B, D, F) represented an immediate initial loss of height on the traumatized side of approximately 6 to 8 mm. This immediate loss of height was not incurred (monkeys C, E) when the condyle was realigned and wired in position. The most astounding situation prevailed in the case of the unilaterally condylectomized animal. (Fig. 4.) A grossly deformed and stunted side was anticipated due to the condylectomy. Yet this condyle reformed and the height was actually 1 mm. greater than the opposite control side. (Fig. 5D.) No satisfactory explanation is offered for this behavior as previous almost documentary evidence [4] describes a totally different deportment. Jarabak [5] describes this complete regeneration of a condyle as being one of three possibilities following mandibular condylectomy in the rat. Selye [7] reported a com-

FIG. 8. A, immediate postoperative anteroposterior roentgenograms of monkey H showing the right and left condyles fractured and dislocated in a medial direction. B, anteroposterior roentgenograms made seventeen months later when monkey H was killed showing condyles which appear to be aligned and normal. C, posterior view of the mandible of monkey H showing both condyles in apparently normal alignment. The right condyle appears to have been mechanically realigned during use and reactive bone in turn enveloped the neck. The condyle was not loose and had firm bony attachment anteriorly. A small fin of resorbing bone at the medial pole of the right condyle is also evident. D, roentgenograms of the right and left rami of monkey H; comparable size and morphology maintained on the two operated sides.

parable reconstitution of growth of new cartilage after amputation of the hind limb (to include the distal epiphyseal cartilage of the femur) of rats twelve to fifteen days old. After repeating Selye's work, Lacroix [8], believed that a zone of endochondral ossification can reform in an amputation stump only if the line of section passes near to the end of the diaphysis with a sort of gradient rising from the middle of the diaphysis to its end in relation to the possibility of reorganization of a growth zone by the bone. It would appear that such a paralleling eventuality has occurred in this one young animal. This particular condylectomy maneuver will be repeated in our future studies of the monkey.

In observing the remarkably reformed condylar areas in this gross pilot study it was regretted that microscopic studies of the reformed condyles were not made. Speculation was offered that the reformed condylar heads could be the result of one of two activities or a combination of the two. Since mobilization of the jaws was permitted immediately following the fracture dislocations, it was postulated that the influence of jaw movement and continued muscular activity in the area on the supremely cramped condyle lying in a medial position could move the condyle up and near its normal position and alignment. The influence of the temporomandibular joint capsule in aiding the reduction and proper alignment of the condyle is another ranking anatomic part that deserves consideration for its potential in the possibility of mechanical repositioning. If one considers the attachment of this capsule to the lateral

ANIMAL	WEIGHT OF ANIMAL AT SACRIFICE (Pounds)	POST-OPERATIVE SURVIVAL TIME (Months)	ALVEOLAR RIDGE TO INFERIOR BORDER (Made just Posterior to Last Erupted Molar)		DEPTH OF SIGMOID NOTCH TO INFERIOR BORDER		TIP OF CORONOID PROCESS TO INFERIOR BORDER		HEIGHT (Tip) OF CONDYLE TO INFERIOR BORDER		WIDTH OF RAMUS (A-P) AT LEVEL OF MANDIBULAR FORAMEN		MAXIMUM BREADTH OUTSIDE CONDYLES (Outer Pole of Left to Outer Pole of Right)
			Right	Left	Right	Left	Right	Left	Right	Left	Right	Left	
Control I	8.2	20	16 mm.	15.8 mm.	31.4 mm.	31.4 mm.	38.8 mm.	39.5 mm.	34 mm.	34 mm.	20.5 mm.	20 mm.	61 mm.
A Bilateral Fracture Dislocations. No treatment	7.4	18	SKULL AND MANDIBLE INADVERTANTLY DESTROYED FOLLOWING PHOTOGRAPHY OF THEM. NO MEASUREMENTS										
B Right Fracture Dislocation. No treatment	7.0	18	15.5 mm.	16 mm.	27.5 mm.	30 mm.	34 mm.	35.5 mm.	31.5 mm.	34 mm.	18.5 mm.	21.5 mm.	56.5 mm.
C Right Fracture Dislocation. Wired in Realignment	6.4	17	14 mm.	14.5 mm.	25 mm.	28.5 mm.	33.8 mm.	34 mm.	31 mm.	32.2 mm.	16.2 mm.	19.2 mm.	56 mm.
D Right Condylectomy	7.1	18	14.5 mm.	16 mm.	28 mm.	31.6 mm.	35 mm.	36.5 mm.	34 mm.	33 mm.	16 mm.	19 mm.	56 mm.
E Right Condyle Excised. Replaced and Wired in Alignment	6.0	18	14.2 mm.	15 mm.	26 mm.	28.2 mm.	34.2 mm.	35.5 mm.	29 mm.	31 mm.	17.5 mm.	21.2 mm.	56.5 mm.
F Left Fracture Dislocation. No treatment.	6.4	17.5	16.5 mm.	16 mm.	31 mm.	31 mm.	35.8 mm.	37 mm.	34 mm.	34 mm.	21.5 mm.	16.5 mm.	57.4 mm.
G Bilateral Fracture Dislocations. Both Wired in Alignment	6.8	17.5	13.2 mm.	13.5 mm.	25.2 mm.	27 mm.	31.5 mm.	31.8 mm.	29 mm.	30.2 mm.	18 mm.	15.2 mm.	58.5 mm.
H Bilateral Fracture Dislocations. No treatment	6.6	17	15.5 mm.	16.2 mm.	29 mm.	30 mm.	36.8 mm.	36.5 mm.	32 mm.	33 mm.	17.2 mm.	17.2 mm.	59 mm.

FIG. 9. Pertinent height, width, and breadth measurements of the mandibular ramus, condyle, coronoid process, sigmoid notch and alveolar ridge at the time the rhesus monkeys were killed sixteen and one half to eighteen months following fracture dislocations.

and medial poles of the condyle and the fact that the fractures were produced at the level of the condylar neck, it becomes credible to envision this capsule acting as a guide and marshalling power in the correct arrangement of the condyle. It is difficult to intentionally tear the capsule or detach it completely, and it is improbable that such a total capsular tearing and detachment from the condyle might occur in a clinical circumstance. The second conjecture suggested that this reformed condylar head represented a fine example of modeling and transformation; i.e., complete resorption of the medially displaced nonfunctional condyle and lateral appositional deposition of bone in reformation of the condyle.

Both conjectures were considered and work was continued in an effort to decide which was the most likely possibility. An item of interest in this tangent of the project was that directed toward determining whether or not the epiphyseal-like cartilage cap of the condyle reconstituted itself in a relatively normal position and with proper polarity to insure normal endochondral ossification and growth from this area.

Young macaca rhesus monkeys were operated once again, this time from the preauricular approach to avoid the detachment of the masseter muscle necessitated in the submandibular approach to the temporomandibular joint. Unilateral fracture dislocations were produced as before and the condyles were left at right angles to normal position in a medial and anterior direction with the raw end of the fragment butted against the bone near the sigmoid notch. In this group of animals the jaws were immobilized by standard intermaxillary wiring technics, and the monkeys were then placed in a specially constructed

FIG. 10. Modified anteroposterior roentgenograms of monkey K. A, note the dislocated and displaced condyle (c) immediately postoperatively. B, one year postoperatively and just prior to killing the animal the completely reformed condyle (c) with total resorption of the old condylar head. Photomicrographs of the right normal and the left reformed condyle seen in Figure 11.

restraining and feeding table. They were sustained on tube feedings of liquids for a period of two weeks at which time the intermaxillary wires were removed, the jaws mobilized, and the animals returned to their usual cages.

Interval radiographs confirmed the medial position of the condyles. Function as an aid in repositioning the condyles was prevented in this group of animals, for function was eliminated through immobilization of the jaw. It became apparent that if reformation was to occur in this group, it was to evolve from a strictly coordinated resorptional and appositional phenomenon. This was subsequently confirmed.

An animal (monkey K, Fig. 10) sacrificed after a postoperative survival of one year had a thickened but fairly acceptable condyle in an upright position within the articular area. Microscopic sections of this condyle demonstrated a clearly identifiable area of cartilaginous growth comparable with that found in any condyle. (Figs. 11B and D.) A completely distinct fibrous covering, zone of cartilage, zone of ossification, and bone existed in the usual condylar, microscopic, anatomic order. The cartilage apparently was active in pursuing its inherent proclivity of endochondral ossification. (Fig. 11B.)

This furnished fairly convincing evidence that the condylar area possesses a noteworthy propensity to reconstitute its epiphyseal cartilage and be about its normal activities following fracture dislocations. The exact route by which this reconstruction evolves seemed to be the logical phase to investigate next. Animals were sacrificed at intervals of one, two and three months following surgically produced fracture dislocations to determine the precise cellular activity involved in the mending and rebuilding of the area.

Study of the microscopic sections disclosed abundant activity in replacing bone posteriorly from the medially and anteriorly displaced resorbing condylar head and thence across the stump of the ramus. Sections of the condylar area from an animal sacrificed twenty-two days following surgery demonstrated profuse meta-

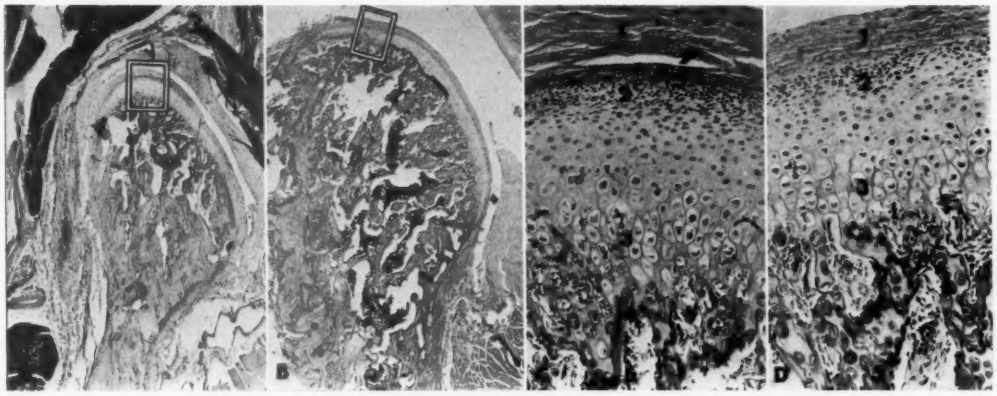


FIG. 11. Low power photomicrographs (original magnification × 13) of monkey K. A, the normal right condyle; B, the somewhat enlarged but normal appearing left condyle. The left condyle was fractured and medially dislocated twelve months prior to killing the animal. High power photomicrographs (original magnification × 140) of both condylar growth areas (boxed areas) of monkey K. C, the comparable and hardly indistinguishable epiphyseal-like cellular morphology of the normal right condyle; D, the apparently normal reformed left condyle. Both condyles possess a normal fibrous covering (1), a transitional or chondrogenic zone (2), a zone of proliferating hyaline cartilage (3) which becomes calcified (4) in its deeper layers, and the area of resorption of calcified cartilage and replacement by bone (5).

plastic cartilage prevailing as the primary cellular repair tissue of the callus indicating a probable relative avascularity of the area produced by the fracturing and trauma or perhaps excess motion permitted in the area by incomplete immobilization of the jaw. In addition the usual locale of this type of fracture is not highly vascular. At any rate the exuberant differentiation of the available osteogenic cells into cartilage indicated that a fairly rapid rate of repair was in progress, with the available osteogenic cells reproducing faster than capillary growth, thereby necessitating the production of a nonvascular tissue, cartilage. In some sections (high power magnification) this callus cartilage appeared to be epiphyseal-like following the usual sequences of calcification and endochondral ossification and resulting in its replacement by bone. Low power magnification of this same region represented nothing more than an extravagant elaboration of metaplastic cartilage in the callus mimicking an epiphysis in the endochondral ossification of this particular area.

Sections obtained from the fracture area of an animal (monkey KK, Fig. 12) sacrificed nine weeks following a traumatic condylar fracture and dislocation demonstrated a total change in healing at this time. The diffuse cartilaginous phase so evident in the animal sacrificed earlier was now superseded by an accretional or appositional type of bone replacement (Fig. 13B). The resorption of the head of the condyle in its medial location (Figs. 12D and 13A) was progressing rapidly, and bone growth proceeding posteriorly and laterally across the stump of the ramus was now by apposition on the free bony surfaces created earlier through metaplasia of cartilage and subsequent ossification. A thick fibrous covering overlaid the new bone with the lower cambium-like lamination serving as the osteogenetic tissue concerned with repair and bone elaboration. (Fig. 13B.)

It becomes evident that the excessive bone produced on the medial surface of the ramus serves chiefly as a scaffold in the reformation of the new and nearly normal condyle. Once the functional importance of its presence as an aid in the reformation has been served this excess bone is resorbed and final contouring of the condyle occurs. This final molding is not an unusual aspect of known bone physiology, and it continues by resorption and apposition for quite some time to perfect the need of the part.

From the meager evidence gathered to this point (on a continuing project) it appears that once the condyle has reformed into an acceptable image of its former outline, metaplasia of cartilage continues and assumes a place along the superior portion of the condyle, becomes epiphyseal-like in function and continues to engender bone (Fig. 11D) with proper polarity

FIG. 12. Modified anteroposterior roentgenograms of monkey KK. A, Note the condyle (c) in its medial relation to the stump of the ramus immediately postoperatively. B, Condyle (c) still radiographically evident one month postoperatively. C, two months postoperatively and just prior to killing. D, inferior-superior roentgenogram of the mandible immediately following its excision from the skull (animal survived nine weeks). Normal condyle (nc) on right in this view. Securely attached resorbing old condyle indicated by arrow 1. Newly elaborated bone indicated by arrow 2. Dotted line indicates line of section for microscopic study of area. Photomicrographs of areas indicated by arrows 1 and 2 seen in Figure 13.

and orientation at a normal rate of growth. As noted, the originally displaced condyle is completely resorbed in the over-all activity.

When mandibular condylar fracture dislocations and displacements in the young macaca rhesus monkey are treated by simple immobilization of the jaw, it appears from these early and few microscopic sections that the process of condylar reformation is purely a phenomenon of coordinated resorption, metaplasia of cartilage and subsequent ossification, and eventual appositional deposition of new bone as required in the re-creation. It is an interesting process but not out of line at all in terms of what is generally known concerning bone repair. It would appear that conservative management of such fractures in these young animals can yield results equally as satisfying as these attained through direct reduction and fixing of the condyle in anatomic alignment. It is generally believed that the young animal or human has the inherent facility to overcome devastating bone injuries of any part with far better results than the adult insofar as form, function, or remodeling are concerned.

These observations of condylar reformation have been equally well recorded in the pediatric patient and will be subsequently reported.

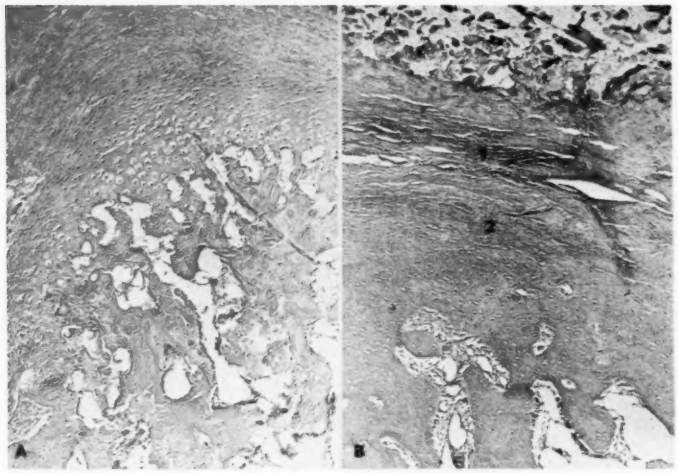


FIG. 13. A, photomicrographs of the resorbing, old, displaced condyle; B, of monkey KK reforming new condyle. Sections made along a slightly oblique sagittal plane of the repair area as shown in Figure 12D. A, photomicrograph showing the resorbing old condyle (as shown by single arrow in Fig. 12D); B, photomicrograph showing the disappearance of profuse metaplastic cartilage and bone elaboration now proceeding by coordinated appositional deposition from the deep osteogenic layer (2) of the periosteum-like tissue. A fairly thick fibrous layer (1) of the periosteum-like tissue overlies the osteogenic layer. The free bony surface on which this appositional elaboration of bone is occurring apparently had its genesis from the profuse metaplasia of cartilage within the early callus. Original magnification × 110.

SUMMARY

In the first series of animals with surgically produced mandibular condylar fracture dislocations, the final results of condylar reformation were comparable whether conservative or surgical treatment was utilized.

Reconstruction of the condyle was at least not appreciably hindered by early mobilization of the jaws following the surgically produced mandibular condylar fracture dislocations.

When the jaws are immobilized in the usual manner of conservative treatment the surgically produced mandibular condylar fracture dislocation begins reconstruction of the condyle in its normal position by coordinated resorption, metaplasia of cartilage and subsequent ossification, and eventual appositional deposition of new bone.

It is not immediately evident whether the early mobilization of the jaw speeds or alters the process of condylar reformation. This will require further study. However, early mobilization of the jaw does not appear to hinder or jeopardize the final result of condylar reformation.

Acknowledgment: I am indebted to Mr. Robert Sage, F.B.P.A., of the Department of Medical Art, The University of Texas Southwestern Medical School, for his patience and thoroughness in the photography of radiographs and photomicrography of submitted specimens.

REFERENCES

1. WEINMANN, J. P. and SICHER, H. Bone and Bones, 2nd ed. St. Louis, 1955. C. V. Mosby Co.
2. ROBINSON, I. B. and SARNAT, B. G. Growth pattern of the pig mandible: a serial roentgenographic study using metallic implants. *Am. J. Anat.*, 96: 37, 1955.
3. RISDON, F. R. Ankylosis of the temporomandibular joint. *J. Am. Dent. A.*, 21: 1933, 1934.
4. SARNAT, B. G. Facial and neurocranial growth after removal of the mandibular condyle in the macaca rhesus monkey. *Am. J. Surg.*, 94: 19, 1957.
5. JARABAK, J. G. Subcondylar fractures of the mandible: research and treatment. *Am. J. Orthodontics*, 40: 729, 1954.
6. ROWE, N. L. and KILLEY, H. C. Fractures of the Facial Skeleton, 1st ed. Baltimore, 1955. Williams and Wilkins Co.
7. SELYE, H. On the mechanism controlling the growth in length of the long bones. *J. Anat.*, 68: 289, 1934.
8. LACROIX, P. The Organization of Bones. Philadelphia, 1951. The Blakiston Co.

Cinefluorographic Studies of Deglutition and Phonation

A PRELIMINARY REPORT

FRANKLIN L. ASHLEY, M.D., ROBERT F. SLOAN, B.A., ELISE HAHN, PH.D. AND WILLIAM HANAFEE, M.D., *Los Angeles, California*

From the Departments of Surgery and Radiology, and the Speech Clinic of the Department of English, University of California at Los Angeles, Los Angeles, California. This work was supported in part by the U. S. Public Health Service, Grant-in-aid RG-6665 (A).

THE lack of technical opportunities for observation has made deglutition the subject of much hypothecation. The differences in interpretation have been mainly concerned with the mechanism by which a bolus passes through the pharynx. The many extensive articles in which the swallowing mechanism is described using radiological procedures are of historical interest. They are not included here as they have been well reviewed elsewhere [*2,6, 10*]. Correspondingly, the references to radiological investigations of phonation have been numerous [*7,9,11*].

Although it is generally accepted that the musculature in the oral and pharyngeal regions is primarily concerned with deglutition, there is some evidence that the soft palate's contact with the superior pharyngeal constrictor muscle during deglutition does not represent a good index of the necessary closure of the nasopharyngeal isthmus during phonation. (Fig. 1.)

MATERIALS AND METHODS

With the patient (in a standing position) swallowing and phonating "ee" [i], "ah" [a],

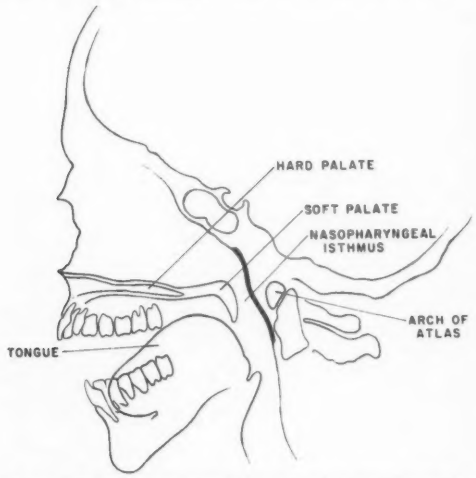


FIG. 1. Illustration of a radiologic tracing demonstrating the important anatomic areas to be considered during phonation. The presence of the nasopharyngeal isthmus indicates palatal incompetence.

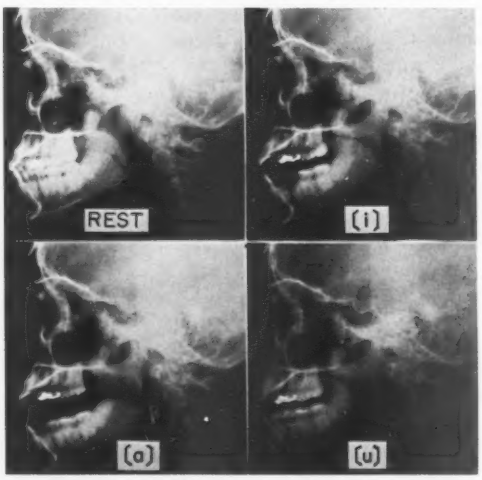


FIG. 2. Four still, lateral x-ray films illustrating the normal kinesiology of the vowel phonemes (Fig. 6), and the bases for the cinefluorographic speech examination. Note the positions of the tongue and soft palate.

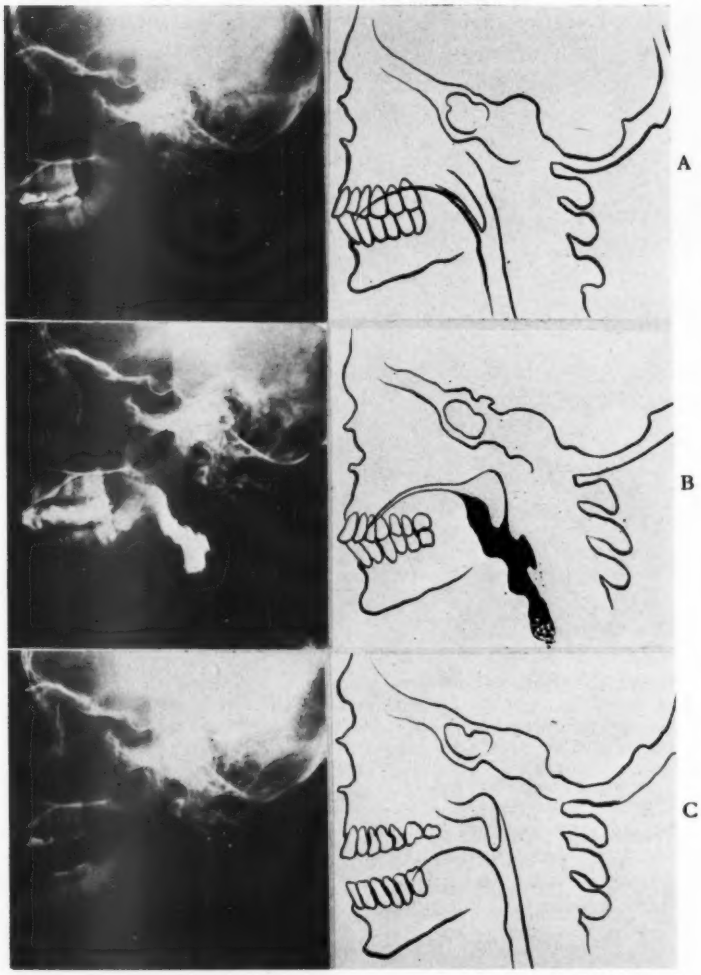


FIG. 3. Three radiologic illustrations demonstrating the normal kinesiological physiology at rest, during deglutition and during phonation of "ah" [ɑ]. A, resting; note position of soft palate. B, deglutition; note closure of nasopharyngeal isthmus by contact between soft palate and superior pharyngeal constrictor muscle. C, phonation; note position of tongue and closure of nasopharyngeal isthmus.

"oo" [u] (Fig. 2), lateral cinefluorographic films are taken at 30 frames per second by a Westinghouse Image Intensifier and Cine Camera. Additional still, lateral x-ray films are made with the patient's head in the cephalometric apparatus. The contrast medium used is barium flavored with vanilla. Eastman Kodak Cineflure films are used for these studies. The movie film is processed through a Kodak-omat (Model mz) developer to allow viewing within thirty minutes.

CASE REPORTS

Two patients (one with a normal vocal mechanism and the other with a pathologic one) were selected to demonstrate the need for separate tests when comparing nasopharyngeal closure during phonation and deglutition.

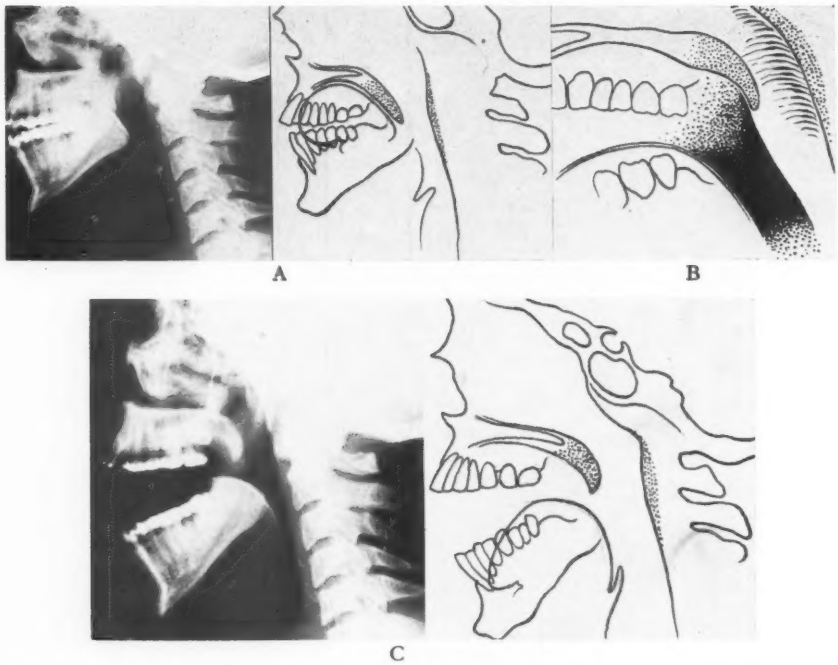


FIG. 4. Three radiologic illustrations demonstrating the kinesiology of palatal incompetence at rest, during deglutition, and during phonation of "ah" [a]. A, resting; note position of soft palate. B, deglutition; tracing of a single frame from the patient's cinefluorographic film demonstrates constriction of nasopharyngeal isthmus with no contact between soft palate and superior pharyngeal constrictor muscle. C, phonation; note nonclosure of nasopharyngeal isthmus.

The normal patient, a twenty-four year old white man, in good health, and with a normal swallowing and speech mechanism, demonstrated the closure of the nasopharyngeal isthmus during phonation and deglutition. (Fig. 3A, B, and C.)

The second patient, a twenty-two year old white man with a repaired cleft palate, in good health but with hypernasal speech, demonstrated lack of closure of the nasopharyngeal isthmus during phonation, but closure during deglutition. (Fig. 4A, B and C.) This patient is now a candidate for a pharyngeal flap.

COMMENTS

The pharyngeal musculature contracts and relaxes during deglutition, to facilitate rhythmical peristalsis. The lips are in contact with each other; the teeth may be in opposition, or slightly parted. The anterior portion of the tongue compresses itself against the hard palate in order to express the bolus backward toward the pharynx. The soft palate shortens, thickens and rises toward the posterior wall of the pharynx forming an inverted "V" (Fig. 3B); the axis of the movement is essentially in the plane of fibers of the levator palati muscles. The fibers of the superior constrictor muscle are contracted, thereby narrowing the pharyngeal aperture as the posterior wall is brought forward to meet the soft palate [1]. As the bolus starts downward the larynx is arched backwards and the tongue of the epiglottis is turned downward closing off the larynx.

After the bolus has been displaced from the pharynx, there is a pause of approximately 0.2 second while it moves down the esophagus. Reinflation of the airways takes place from the larynx (below) and from the pharynx (above) [1].

In contrast to the fairly predictable physiology of swallowing, the kinesiology of phonation changes for each phoneme being produced.

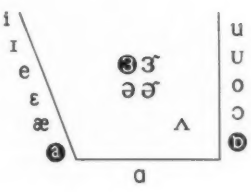


FIG. 5

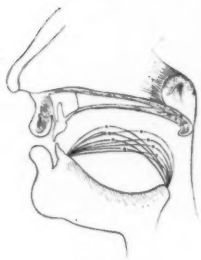


FIG. 6

FIG. 5. This chart illustrates the common vowels. The uncircled vowels are common in American speech. The front vowels (left column) are produced with the tongue in the anterior portion of the mouth. The medial vowels are produced when tongue is in midline. Back vowels (right column) are produced when the posterior aspect of the tongue is elevated toward soft palate. Front vowels (top to bottom) indicate the opening of the mouth. The top (small opening) is "ee" [i]. "Ah" [ɑ] is produced with the mouth wide open (bottom of chart).

FIG. 6. This drawing represents the position of the tongue during the phonation of each vowel. The anterior dots represent the front vowel positions and the posterior dots represent the back vowel positions.

Figure 5 illustrates the variety of positions of the tongue during the production of the vowels common in American speech. (Fig. 6.) For each position demonstrated in Figure 7, a different consonant sound is produced. If a phoneme, such as "ah" (ɑ) (Fig. 3C and 4C), is isolated and produced, the kinesiology is usually consistent and can be described. However, an analysis of even a short sentence such as, "Ring the bells and sing," with its variety of nasal and oral sounds, would involve lengthy description of muscle movements. Therefore, we have selected the phoneme "ah" (ɑ), because it presents a good contrast between deglutition and phonation.

In American speech, there are only three phonemes [n], [m], [ŋ], that are normally considered nasal sounds (i.e., when the soft palate does not contact the superior pharyngeal constrictor muscle (in the posterior pharyngeal wall). It is true that a slight degree of nasality is a characteristic of American speech and that the soft palate often does not make a complete contact with the superior constrictor muscle. When the nasopharyngeal isthmus is open only slightly (which occurs in some phonation), it is very difficult to observe radiologically. However, we can probably assume closure or near closure of the nasopharyngeal isthmus during the phonation of oral sounds.

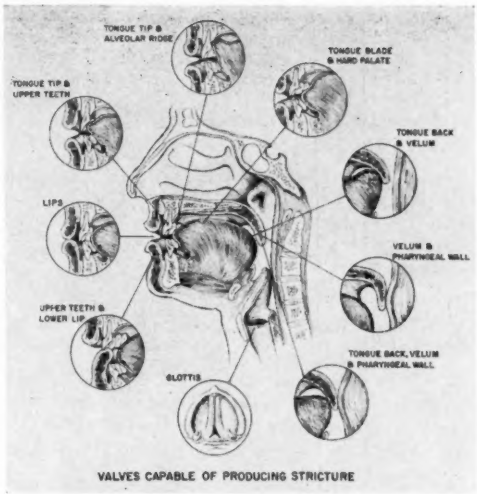

TONGUE TIP & ALVEOLAR RIDGE
TONGUE BLADE & HARD PALATE
TONGUE TIP & UPPER TEETH
TONGUE BACK & VELUM
LIPS
VELUM & PHARYNGEAL WALL
UPPER TEETH & LOWER LIP
TONGUE BACK, VELUM & PHARYNGEAL WALL
GLOTTIS
VALVES CAPABLE OF PRODUCING STRICTURE

FIG. 7. This chart represents the kinesiological positions for the oral pharyngeal musculature during the articulation of American phonemes. Example: when the tongue tip is in contact with the alveolar ridge the plosive sounds [d] [t] and fricative sounds [z] [s] are produced; when the tongue is back in contact with the velum the plosive sounds [g] [k] are produced; and when the tongue is in contact with the velum and pharyngeal wall the nasal sounds [m] [n] [ŋ] are produced.

SUMMARY

In this preliminary report, a description of cinefluorographic instrumentation is presented. A basic diagnostic test to compare deglutition and phonation more efficaciously is outlined.

Illustrations of the fundamental kinesiology necessary to produce American phonemes are included to complement the normal patients and patients with palatal incompetence.

REFERENCES

1. ARDRAN, G. M. and KEMP, K. H. A radiographic study of movements of the tongue in swallowing. *The Dental Practitioner*, 5: 252, 1955.
2. BARCLAY, A. E. The normal mechanism of swallowing. *Proc. Staff Meet. Mayo Clin.*, 5: 251, 1930.
3. BARCLAY, A. E. The Digestive Tract. A Radiological Study of its Anatomy, Physiology and Pathology. New York, 1936. Macmillan Co.
4. CANNON, W. B. and MOSER, A. The movements of food in the esophagus. *Am. J. Physiol.*, 1: 435, 1898.
5. JOHNSTONE, A. S. A radiological study of deglutition. *J. Anat.*, 77: 97, 1942.
6. MOSHER, H. P. and MACMILLIAN, A. S. X-ray study of movements of the tongue, epiglottis, and

hyoid bone in swallowing, followed by discussion of difficulty in swallowing caused by retropharyngeal diverticulum, postcricoid webs and exostosis of cervical vertebrae. *Laryngoscope*, 37: 235, 1927.

7. Norris, M. A. X-ray studies of vowel production as it is related to voice. Unpublished Master's Thesis, State University of Iowa, 1934.
8. Oldfield, M. D. Mechanism for the production of speech sounds. *Brit. J. Surg.*, 35: 178, 1947.
9. Rippman, W. Elements of Phonetics. London, 1899. J. M. Dent and Sons.
10. Ramsey, G. H., Watson, I. S., Gramiak, R. and Weinberg, S. A. Cinefluorographic analysis of the mechanism of swallowing. *Radiology*, 64: 498, 1955.
11. Sloan, R. F., Hahn, E., Hanafee, W. and Ashley, F. L. Cinefluorography as a diagnostic tool in the study of the speech mechanism. Unpublished results.

Early Closure of Cleft Lip and Palate

LOUIS W. SCHULTZ, M.D., D.D.S., *Chicago, Illinois*

From the Department of Surgery, The Presbyterian Hospital of the City of Chicago and the University of Illinois College of Medicine, Chicago, Illinois, and the West Suburban Hospital, Oak Park, Illinois.

THE pendulum is swinging in the right direction regarding the correct time for closure of cleft lips and palates. The trend is toward early closure of these lesions. The younger surgeons have had the advantage in that they see the end result of the work performed by the older men. Keen judgment on the part of the younger group shows them that a change in timing is important to get better results. This has prompted many surgeons to operate on these patients at the most advantageous time.

This specialty is now dominated by surgeons, pediatricians, dentists, orthodontists, prosthodontists, ear, nose and throat specialists, speech teachers, x-ray technicians, social workers and psychiatrists, all of whom play a very definite role. However, some add considerable confusion to the entire program. It was enough of a burden for the parents to see a reputable surgeon to have this entity corrected and have him as a consultant for their queries. One entity at a time could be settled when it arose. Now, when the parents are confronted with the multidisciplinary approach, and good and bad advice, they become alarmed to say the least. This undoubtedly will have a very decided effect on the welfare of these children in the next few years. The program may produce some beneficial results eventually, but for the moment it has led to inadequacies for which the patient has paid the price.

Up to the present time the majority of plastic surgeons operate on cleft lips at two or three weeks of age. The closure of the palate is accomplished at approximately two years of age. Some will not operate upon these patients in the winter, some want to operate on the palates when the patient is four or five years of age or older, and still others do not want to close them at all. This is confusing to one who is not well experienced in this work. One who has spent many years with "old man experience," however, is not confused and can answer these problems as they arise. Lips should be closed at two or three weeks of age and palates at two to six months of age, depending on the complications confronting the particular patient. There is no contraindication for this type of surgery from the standpoint of seasonal changes or weather conditions. The results are the same in winter or summer.

The baby's future, health, happiness and welfare are at stake when a decision is made in regard to the time for surgery. The earlier this type of work is done, within certain limitations which I shall enumerate later, the better it will be for the child.

The surgeon who operates upon a baby to correct a cleft lip within the first few hours or days of life is to be condemned for doing so. This is an operation of choice, not an emergency; therefore, it should be performed when the baby is in the optimum physical condition to withstand the procedure and when examination of the heart, liver, lungs, spleen, kidneys and digestive tract has shown beyond a doubt that the baby is going to be a healthy, viable one. This means that about two weeks of age is as early a time as can be chosen for the closure of a unilateral cleft lip.

The question of sequence of these operations is in order. As a rule, when a baby is born with a cleft lip and palate and one has the power to select the time for closure, my practice has been to close the lip at about two weeks of age and perform a closure of the palate at three to six months of age. If a baby with a cleft lip and palate is brought to one's attention at the age of six months or older (up to two years), I believe the palate should be closed first so the

baby may have the optimum advantage of an early closure of the palate and resultant perfect speech.

Bilateral cleft lips and palates, as a rule, must be handled a little differently. Here we usually have the intermaxillary segment of bone and lip tissue projecting from the tip of the nose. The best results are obtained by my method of closing the bilateral cleft lip on both sides at once which produces pressure on the intermaxillary segment of bone, causing it to move slowly between the two maxillary segments. This should be followed in three to six months by a closure of the palate.

The cleft palate, whether unilateral or bilateral, or whether it involved just the soft palate and hard palate, or the soft palate, hard palate and alveolar ridge, should be closed just as early as possible. The term "early" means within a period of three to six months after birth. This time of closure depends entirely on the width of the cleft, the weight of the baby, the power of the baby to assimilate food, and all of the other factors involved that predetermine a successful result. I never willfully wait longer than six months to close a cleft palate. The main reason for early closure of palates is the good result obtained at this time in healing, with subsequent normal health and speech.

The author is perfectly aware of the possibility of lack of development of the upper jaw in early closure of cleft palates in some cases. This, unfortunately, has been a point of argument on the part of some surgeons engaged in this work. A speech defect will frequently result if the palate is closed at eighteen months or older.

In my opinion, cephalometric examinations to determine growth patterns are useless effort and play no essential part in this program, particularly when one knows the factors causing the disturbance and knows what must be done to prevent this occasional lack of growth. It is obvious that a normal child is growing periodically from birth until about eighteen years of age. Surgeons know the pattern of development of bone may be interrupted by elevation of periosteum, disturbance of the growth centers or epiphyseal line, limiting the blood supply, or many other causes. This growth must be weighed against all other factors and the lesser of the two evils chosen. As long as each individual baby is an entity in itself, it must be dealt with as such. Since there always will be a difference in surgeons doing this type of work, there can be no arbitrary time limit for the operation of all cases. Sound reasoning, careful judgment, early approximation of normal muscle tissue that should be antagonistic in action, as well as surgical skill and good postoperative treatment make it possible to close these palatal defects in one operation.

Let us be honest in our thinking and weigh the seriousness of advantages and disadvantages correctly. When a cleft palate is closed at three to six months of age there may be a lack of development of the upper jaw in a few instances. To avoid this it would be necessary to wait until the child is twelve to sixteen years of age or older before surgery could be done. Only then will the child develop normally. Closure of a palate at two years of age is a great deal more serious than at six months of age. A two year old child has a mind of his own and a temper. He is eating solid foods and is not satisfied with milk alone. This child will not be quiet postoperatively; therefore, healing may be retarded. An infant of six months wants milk principally, and by keeping the stomach filled, he will sleep most of the time.

On the other hand, early closure prevents a speech defect, an inferiority complex, a chronic otitis media, a chronic progressive deafness, a possible mastoiditis, atrophic pharyngitis, a loss of all the fine co-ordinated muscular movements of the lip, cheek, tongue, throat and palate, as well as the development of bad habits in speech by using the imperfect parts. All of the foregoing conditions are prevented for one reason only: the baby's central nervous system develops simultaneously with the development of these related parts. It is relaying normal impulses to these imperfect parts which have not been corrected. Now they respond normally. The parts, being anatomically correct, can now react in normal fashion which is totally impossible in the later closure of a cleft palate at two years of age or older. All of these children are prone to mimic the sounds they hear. Regardless of perfect or imperfect closure, they will make this attempt which may result in the development of very bad habits due to an imperfect mechanism, or may have a perfect result with a perfect stimulation and a perfect anatomic mechanism. Upon swallowing, one feels the impulse given to the middle ear which causes a patency of the eustachian tube and a ventilation of the middle ear. This cannot be

experienced by a baby with an disunited cleft palate and throat. Therefore, this baby develops the chronic otitis media and deafness mentioned previously. This condition clears rapidly within four or five days after the closure of a cleft palate.

I have believed for many years that an acute or chronic otitis media in a child born with a cleft palate is a definite indication for closure of the palate at just as early a time as possible, notwithstanding the acuteness or chronicity of the infection, or the temperature of the patient. Otitis media clears immediately postoperatively and the baby becomes afebrile. This seems in direct violation of the principles of surgery. However, if one stops to consider the number of times a baby swallows from the age of three to six months to two years or older (2,800,000 times) and tries to evaluate the benefit of this antagonistic action in developing the palatal muscles by ordinary swallowing and ventilating the middle ear, one must realize the tremendous benefit gained by early closure. This adds to the length of the palate, the normal action of the musculature, the perfect timing in co-ordination with other muscular action in that region. It is this antagonistic action early in life that causes the patency of the eustachian tube and ventilation of the middle ear which are so important to these children. The constant surge of normal impulses coming from the central nervous system to these parts from birth on demands that a perfect closure be made at as early an age as possible.

When these children return to the office for postoperative visits talking normally and their parents are completely satisfied with one operation instead of a series of fifteen or twenty, it is an indication that the work is being done correctly.

The one factor of lack of development in some cases can be corrected easily by sending the patient to a reputable orthodontist for regulation of the teeth, or a dentist for a denture made to correct the lack of development in any dimension. I feel that this one phase cannot hinder the progress that has been made in this particular type of surgery.

The baby three to six months of age is an infinitely better risk for closure of the hard and soft palate than a baby two years of age or older. The baby three to six months of age wants to eat and sleep, is not as sensitive to the operation, does not have the temper of a baby of two years, is more easily controlled by sedation than a baby of two years, and does not have to be taken off solid foods during the postoperative recovery period. The baby three to six months of age does not recognize its mother, friends or relations; however, a baby two years of age or older cries upon separation from familiar faces which is a very definite detriment to perfect closure of the palate. Also, the tongue movements of a baby two years old or older are more destructive than those of a sleeping baby four to six months of age.

An indwelling catheter, passed at the time of the operation for postoperative feeding, is tolerated better by a baby six months of age than one of two years. This again prevents 122,640 postoperative swallows during the two-week healing period, reflecting a perfect palate.

Early surgery, at two to six months of age, is definitely indicated in the child who is born with a cleft palate associated with micrognathia. These children are harassed by the one serious complication of strangulation by swallowing the tongue. The anatomy again plays a very important role in the correction of these deformities. Many things have been thought of and done, with discouraging results. When a baby is sleeping, the throat and the tongue become dry and the tongue inadvertently falls back into the nasopharynx and is adherent there by the mucilaginous contact of the mucous membranes. Since he is physically unable to correct this condition, the child proceeds to turn blue and strangle. This condition has been treated in many ways, often unsuccessfully. First, the baby should never be allowed to lie on its back. It should always be on its side, or preferably on its stomach, which will cause the force of gravity to hold the tongue forward and facilitate normal respiration. Some practitioners place a silk or wire ligature in the tongue which only causes lacerations through this organ and causes unnecessary discomfort. Some put a hook in the lower jaw to draw the jaw forward which may end in a very serious disturbance in the temporomandibular joints at a time when they are unable to stand the strain. Some surgeons resort to a permanent tracheotomy which also has its dangers and disadvantages, and some suture the tongue to the lower lip, creating unnecessary scarring and developmental interference. This condition demands an early closure of the cleft palate to create a normal air

stream. This produces a normal vault so that the tongue can rest against the soft palate, leaving the normal nasopharyngeal opening for breathing through the nose. This is another indication for early closure of the cleft palate at two to three months of age, if possible. It has been done successfully in many cases.

The use and abuse of prosthetic appliances in connection with cleft palate surgery merits some discussion. To clarify this situation, it should be emphasized that no artificial appliances in the form of an obturator should ever be used with the idea of closing the cleft of the hard and soft palate, or either one alone, if it is at all possible to close the opening with the patient's normal tissues. There is no question about the normal mucous membrane and muscle tissue covering a gap of this kind being infinitely more comfortable and safer in the long run than any appliance that could be built. Prosthetic appliances or dentures should be made after tissues have been closed to restore missing teeth and lack of anteroposterior, vertical and horizontal dimension. Prosthetic appliances to fit accurately over solid structures that have little motion can be made satisfactorily. Where there is a great deal of motion, as in the soft palate and throat, and a soft rubber velum is incorporated in the prosthetic appliances, I severely condemn the soft porous rubber velum which is intended to move in unison with the muscle of the soft palate. These muscles should be antagonistic and should not be allowed to function without purpose. This porous material is unhygienic and cannot come in contact with the tissue secretions, food and saliva and still be expected to stay clean. The constant irritation of an appliance of this kind in the later years of life can only be a predisposing factor for ensuing carcinoma. For this reason, every effort should be made to close the palatal gap with the normal tissues.

COMMENTS

A tongue suture is to be placed in all children who are operated upon under a general anesthetic and is to be left in until full consciousness is regained. A silk suture is placed with a large, thin curved needle; it is started in the floor of the mouth just in back of the opening of Wharton's duct and passed straight back, deep in the tongue; the exit is as close to the circumvallate papilla as possible. Then a knot is tied in the two ends and a mosquito hemostat fastened to the suture. This pulls out the body of the tongue and facilitates breathing.

Tongue depressors of the straight metal type are increased in usefulness when curved on the end in about ½ inch radius. This makes a good tongue depressor and elevator.

Catheterization for anesthesia in surgery of bilateral cleft lips can be improved by passing a wire of sufficient weight and strength from the tip back 8 or 10 inches so as not to occlude the lumen of the catheter and then bending the wire to the curvature of the tongue, letting the catheter come from below upward over the lower lip and tongue down into the throat. This can be held with a towel clip and will not be in the way; it will not distort the segments of the upper lip or nose during the operation.

SUMMARY

1. Always be seated to correct cleft lips and palates.

2. Seasons of the year have no influence on the optimum time for operation.

3. The future happiness of the child and the parents is made or broken by surgery.

4. The baby is not to be operated upon before one or two weeks of age; it is not an emergency.

5. The lip is to be closed first at about two weeks of age and the palate is to be closed in three to six months.

6. The baby is placed in Trendelenburg position for operation.

7. There may be lack of development of upper jaw in some cases. A denture or orthodontia will compensate for this.

8. Many serious conditions develop if the palate is closed at two years of age or older.

9. Early closure of the palate (at three to six months of age) will prevent abnormalities of development.

10. Early closure of palate is a "must" when a child has an associated otitis media or a micrognathia.

11. Indications and contraindication for the wearing of a prosthetic appliance are as follows: The use of a denture is indicated (a) when a cleft cannot be closed surgically, (b) to close the nasopharyngeal space, (c) to restore vertical dimension, (d) to restore anteroposterior dimension, (e) to restore lateral dimension, and (f) to restore the occlusal plane. A denture is contraindicated in patients whose

defect (a) can be corrected by orthodontia; (b) can be corrected by bridgework; (c) can be corrected by exercise; (d) has a possible chance of developing normally.

12. Failure of palatal healing is not due to infection but to tension and destruction of blood supply.

13. Suggestions for facilitating the technic of early closure are as follows: (a) use a suture in the tongue; (b) use a tongue depressor and elevator ("tongue controller"); (c) use a catheter and wire for administering anesthesia for repairing bilateral cleft lips; (d) use an aspirator instead of a sponge; (e) use the smallest atraumatic needle and suture; (f) cut sutures short on the knot or 1 mm. long; (g) leave the tongue suture in until the baby is fully conscious; (h) administer fluids and food as soon as tolerated; (i) administer penicillin for the first week; (j) administer sedation as required; (k) use an indwelling catheter for one or two weeks for feeding; (l) do not restrain the baby for inspection of the palate postoperatively; (m) have an aspirator in the room at all times; (n) use straight arm restraints during the healing period to prevent fingers from getting into the mouth; and (o) feed the baby with an ear syringe, medicine glass, teaspoon or plastic cup with a cover and spout.

REFERENCES

1. Blackfield, H. M. and Wilde, N. J. Lateral facial clefts. *Plast. & Reconstruct. Surg.*, 6: 68, 1950.
2. Davis, A. D. Medical clefts of lower lip and mandible. *Plast. & Reconstruct. Surg.*, 6: 62, 1950.
3. Huffman, W. C. and Lierle, D. M. The repair of the bilateral cleft lip. *Plast. & Reconstruct. Surg.*, 4: 489, 1949.
4. Ivy, R. H. Modern concept of cleft lip and cleft palate management. *Plast. & Reconstruct. Surg.*, 9: 121, 1952.
5. Ivy, R. H. Recent trends in cleft palate treatment. *Plast. & Reconstruct. Surg.*, 5: 537, 1950.
6. Moran, R. E. The pharyngeal flap operation as a speech aid. *Plast. & Reconstruct. Surg.*, 7: 202, 1951.
7. Schultz, L. W. Bilateral cleft lips. *Plast. & Reconstruct. Surg.*, 1: 338, 1946.
8. Schultz, L. W. Care of cleft lips and palates in babies. *Illinois M. J.*, 86: 138, 1944.

Book Reviews

Anesthesia for Infants and Children. By Robert M. Smith, M.D. 418 pages. C. V. Mosby Co. St. Louis, 1959. *$12.00.*

By providing a comprehensive text on pediatric anesthesia, Dr. Smith has made an outstanding contribution to this rapidly growing field. Assuming that his reader has a basic knowledge of anesthetic principles prior to undertaking the care of infants, it was possible to omit unnecessary detail.

The book begins with a thorough discussion of the differences between infant and adult physiology. One entire chapter is devoted to respiratory physiology in infants. From here the subject matter turns naturally to preparation of the child for operation, preanesthetic medication and then to the anesthetic equipment which is so different from that of the adult. From these considerations, the book progresses to technics, choice of anesthetic and special or unusual problems related to children.

The emphasis on surgical problems related to infant pathology should prove valuable to the anesthesiologist who treats children only occasionally. There is also a thorough discussion of fluid therapy and blood replacement during surgery and in the postoperative period. Finally, there is an interesting chapter on pediatric surgical mortality.

It is unfortunate that the text was written just prior to the widespread use of halothane (Fluothane®), since this drug threatens to cause substantial changes in recommended procedures. It is heartening that a recognized authority advocates the use of explosive drugs in the presence of cautery if the relative safety of the patient warrants it.

This book will undoubtedly be a standard reference for pediatric anesthesia, useful to all residents and practitioners administering anesthesia to children. The excellent bibliography with each subject alone is sufficient to recommend the work.

JOHN P. GARVIN, M.D.

A Manual of Anaesthetic Techniques. By William J. Pryor, M.B., CH.B., F.F.A.R.C.S. 228 pages. John Wright & Sons, Ltd. Bristol, Eng. 1959. *$7.00.*

In this manual, an English anesthesiologist has touched lightly on the many aspects of the practice of anesthesia with no attempt at profound discussion. Because the author is British, many of the technics as well as the equipment described do not apply in the United States. Its usefulness will be limited to physicians familiar with technics and procedures commonly used in anesthesiology.

WILLIAM HAMELBERG, M.D.

BOOKS RECEIVED FOR REVIEW

All books received will be acknowledged in this column. Insofar as possible, as space permits, books of special interest will receive more extensive reviews.

Cancer and Allied Diseases of Infancy and Childhood. Edited by Irving M. Ariel, M.D. and George T. Pack, M.D., with 27 contributing authors. 605 pages. Little, Brown & Co. Boston, 1960. *$22.50.*

Interpersonal Relationships in the Hospital. Warner F. Bowers, M.D. 125 pages. Charles C Thomas. Springfield, Ill., 1960.

Mitra Operation for Cancer of the Cervix (Extraperitoneal Pelvic Lymphadenectomy and Radical Vaginal Hysterectomy). Subodh Mitra, M.B., D.M. 93 pages. Charles C Thomas. Springfield, Ill., 1960. *$6.00.*

Clinical Obstetrics and Gynecology, Volume 2, Number 4. Advances in Gynecologic Surgery edited by S. B. Gusberg, M.D.; Cesarean Section edited by Edwin J. De Costa, M.D. 1228 pages. Harper & Brothers. New York, 1959. *$18.00.*

Surgery in World War II: Neurosurgery, Volume 2. Edited by Col. John Boyd Coates, Jr., M.C. 705 pages. Office of the Surgeon General, Department of the Army. Washington, D.C., 1959.

That the Patient May Know. An Atlas for Use by the Physician in Explaining to the Patient. Harry F. Dowling, M.D., SC.D. and Tom Jones, B.F.A. W. B. Saunders Co. Philadelphia, 1959. *$7.50.*

Author Index, Volume 100

Accinno, M. A., 91
Allen, J. E., 648
Anderson, A. A., 761
Andrews, N. C., 490
Ansingh, H., 358
Arnspiger, L. A., 103
Ashley, F. L., 864

Baker, H. W., 323
Barker, W. F., 165
Bartenbach, G. E., 43
Basile, J. X. R., 434
Beahrs, O. H., 813
Beal, J. M., 1, 561
Bechtol, C. O., 124
Beck, W. C., 363
Becker, A., 43
Bell, H. G., 416
Bell, J. W., 757
Benjamin, H. B., 43
Bergner, L. H., 480
Berne, C., 153
Berne, C. J., 346
Bickell, W. H., 698
Bilton, J. L., 764
Biskind, G., 126
Blake, K., 396
Blocker, T. G., Jr., 805
Boldrey, E., 633
Bonilla, K. B., 731
Bowers, W. F., 110, 731
Boyden, A. M., 206
Boyer, J. L., 71
Boyle, J. F., 346
Bradham, R. R., 557
Bramson, M. L., 338
Brav, E. A., 423
Brickley, H. D., 107
Britt, C. I., 490
Broccolo, E., 107
Bromberg, B. E., 818
Brown, M. E., 48
Buchanan, E. B., 620
Burch, R. J., 825
Butler, E. D., 293
Byrne, J. J., 98

Cabrera, A., 551
Cammack, K. V., 54
Cammock, E. E., 757
Cantor, M. O., 584
Carter, R., 262
Chambers, R. G., 613
Charache, H., 522
Clancy, C., 737
Cliffton, E. E., 447
Clough, D. M., 122
Cobb, E. G., 384
Cohn, R., 158, 258
Coleman, W. O., 475
Condon, R. E., 234, 544
Connell, B. F., 747
Cottrell, T. L. C., 527
Couves, C. M., 709, 715
Craven, R. E., 802
Crawford, E. S., 22
Cremin, J. H., 224
Crews, E. R., 68
Cruze, K., 630
Culiner, M., 126

De Bakey, M. E., 22
de Lorimier, A. A., 293
Dean, M. A., 98
DeStefano, N. M., 122
Dineen, P., 470, 534
Dodds, M. E., 54
Dubrow, A. A., 630
Duffy, J. J., 434
Duran, R. J., 802

Earle, A. S., 782
Edgehill, H., 416
Elliott, H. B., 54
Ellison, E. H., 511
Erb, W. H., 30
Erich, J. B., 401, 539
Etheredge, S. N., 200

Falk, S., 597
Farrell, J. J., 690
Feigen, G. M., 194
Fell, E. H., 8
Fernicola, A. R., 465
Fett, H. C., Jr., 753
Fitzgerald, J. B., 22
Foraker, A. G., 4
Fox, R. A., 693
Francis, K. C., 617
Fraser, M., 646
Freeark, R. J., 107
French, J. D., 354

Gallagher, W. B., 407
Gaspar, M. R., 171
Gerbode, F., 338
Gitlitz, G. F., 439
Glanz, S., 412
Golden, T., 789
Gomez, A. C., 613
Goodsitt, E., 764
Gordon, A. S., 332
Graf, C. J., 587
Grafe, W., 561
Grassi, J. E., 606
Gray, A. R., 709, 715
Greenwood, G. J., 823
Grimes, E. L., 30
Grimes, O. F., 278, 602
Grossi, C. E., 447
Gruhn, J., 396

Hahn, E., 864
Hainline, A., Jr., 5
Hall, D. P., 145, 505, 653, 797
Hamandi, W. J., 381
Hamill, J. P., 293
Hanafee, W., 864
Hanlon, C. R., 779
Harkins, G. A., 338
Harkins, H. N., 234
Harless, M. S., 515
Harrison, E. G., Jr., 539
Harrison, W. H., Jr., 709, 715
Hart, J., 165
Henderson, J., 439
Hepps, S. A., 64
Hill, J. T., 630
Hinds, E. C., 825
Hinshaw, D. B., 245
Hirsch, J. E., 515
Hoar, C. S., Jr., 486
Hoerr, S. O., 5
Hosay, J. J., 672
Howard, J. M., 709, 715
Howard, M. A., 217
Hoye, S. J., 486
Hubbard, T. B., Jr., 600
Hughes, C. W., 110
Hurley, L. A., 12
Hurwitt, E. S., 439, 512
Hutchin, P., 623
Hutchinson, W. B., 251

Ihrig, H. K., 43

Joergenson, E. J., 262
Johnston, J. B., 338
Jones, J. C., 332
Jones, S. A., 262
Juncker, A., 693

Kaplan, A., 107
Kelley, D. J., 597
Kenner, G., 117
Kiriluk, L. B., 251
Kissen, A. T., 64
Kragh, L. V., 401, 539
Kratzer, G. L., 381
Krempin, H. O., 103

La Sorte, A. F., 593
Laird, E. G., 129
Lary, B. G., 690
Lebendiger, A., 439
LeCompte, P. M., 48
Lega, J., 551
Levitt, L. M., 753
Lieberman, B., 91
Lindquist, H. D., 617
Lloyd, F. A., 527
Lloyd, J. R., 137
Lobb, A. W., 358
Loehrer, D. C., 384
Lombardo, C. R., 666
Lord, G. H., 439
Luddington, L. G., 332

Macksood, A. J., 54
Mahoney, E. M., 133
Majnarich, G., 740
Manlapaz, J. S., 723
Mansfield, R. D., 462
Mansueto, M. D., 835
Marmor, L., 124
Martin, J. G., 103
Masson, J. K., 747
Mathewson, C., 258
Mathewson, C., Jr., 158
May, A. M., 126
McGonigle, J., 124
McKenzie, A. D., 176
Meade, J. W., 120
Merendino, K. A., 375
Meyer, B. W., 332
Mieszczanski, A. W., 431
Morales, H., 764
Morse, H. N., 143, 498, 651, 787
Moskovitz, W. S., 110
Muller, W. H., Jr., 572
Murphy, G. P., 666
Murphy, R. T., 764
Murray, G., 676
Murray, J. E., 486
Myers, R. N., 744

Neilson, R. O., 206
Nelson, B., Jr., 258
Nelson, S. W., 148, 500, 660, 798
Nissan, S., 59
Nobel, W., 635
Nyhus, L. M., 234, 544

Oeconomopoulos, C. T., 457
Olson, K. C., 597
Osborn, J. J., 338
Osborne, M. P., 48

Pace, W. G., 590
Panagopoulos, A. P., 835
Parker, M. L., 661
Pearce, J. M., 561
Pevehouse, B. C., 633
Phillips, J. W., 384
Pichel, R., 753
Pierandozzi, J. S., 245
Pinck, R. L., 753
Pitt, L. P., 737
Porcaro, F., 113
Porter, R. W., 354
Pratt, G. H., 389

Rawson, C. W., 91
Regan, J. F., 224
Reid, L. C., 825
Rhoads, W. D., 384
Richards, V., 158, 384
Ritchie, J. L., 384
Rivlin, R. S., 639
Robinson, M., 845
Roeder, C. A., 589
Rose, R. S., 643
Rosenman, L. D., 194
Ross, J. K., 338
Rubenstone, A. I., 661
Rubin, L. R., 818

Salvati, E. P., 381
Saporta, J. A., 94
Saracco, T., 396
Sbarbaro, J. L., Jr., 751
Schlitt, R. J., 682
Schultz, L. W., 869
Scott, J., 38, 663
Seipel, R. S., 293
Serlin, O., 682
Shearburn, E. W., 744
Shieber, W., 117
Shirokov, E. P., 530
Simon, M. M., 85
Sirak, H. D., 455
Sloan, R. F., 864
Smith, B., 140
Smith, E. P., Jr., 623
Smith, L. L., 262
Sommers, S. C., 606
Soranno, C. A., 113
Stafford, C. E., 245
Steiger, Z., 8
Stein, J. J., 808
Stern, W. E., 303
Stewart, W. R. C., 495
Stinchfield, F. E., 12
Stonesifer, G. L., Jr., 666
Storey, C. F., 71
Stout, A. P., 740
Straub, L. R., 751
Sullivan, C. R., 698
Sweeney, W. J., III, 470
Swenson, O., 457

Tabet, B. J., 365
Thorbjarnarson, B., 561
Tolstedt, G. E., 757
Treiman, R. L., 171

Utzinger, W., 158

Valadka, B., 527
Vansant, J. H., 572
Veveloyiannis, D. P., 672
Voris, H. C., 434

Wagner, M., 43
Walden, R. H., 818
Walker, R. V., 850
Webster, G. V., 372
Weinberg, M., 8
Weitzman, J., 346
Wellington, J. S., 183
Willman, V. L., 779
Wilson, J. C., Jr., 313
Wilson, J. S., 761
Winfield, J. M., 480
Winterscheid, L. C., 375
Wise, R. A., 323
Wylie, E. J., 183

Yoon, C., 845
Youmans, R. D., 613

Zeier, F. G., 12
Zeifer, H. D., 693
Zeit, W., 43

Subject Index, Volume 100

(E) = Editorial (DC) = Diagnostic Corner (CAC) = Case Analysis Clinic

Abdominal
  and pelvic procedures, Monilia albicans fungemia following, treated with Amphotericin B, 470
  and perineal resection, synchronous, of rectum for carcinoma, 194
  aortic aneurysms, intact and ruptured, 176
  injuries, non-penetrating, 22
Aberrant subclavian artery, management of division of (CAC), 137
Acinic cell adenocarcinoma of parotid gland, 639
Acromial process, excision of, for chronic dislocation of shoulder, 91
Adenocarcinoma
  acinic cell, of parotid gland, 639
  of appendix, 630
Adhesive tape, non-irritating, 789
Aerosol, pancreatic dornase, in postoperative atelectasis, 447
Aged
  cholecystostomy in, 544
  postoperative psychosis in, 38
Ainhum (dactylolysis spontanea), 480
Airway, preservation of, in surgery for goiter, 85
Aldosteronism, primary, syndrome of mineralocorticoid excess, 158
Amphotericin B in Monilia albicans fungemia following pelvic and abdominal procedures, 470
Amputation, lower extremity, in peripheral vascular disease, 682
Amylase, serum, rapid screening test for, 5
Anesthesia, local, for inguinal herniorrhaphy, 782
  physiologic basis for cardiac arrest during, 354
Aneurysms, abdominal aortic, intact and ruptured, 176
Anorectum, anatomy of, 666
Anorganic bone grafting, 12
Antrum and upper jaw, squamous cell carcinoma of, 401
Aorta, coarctation of (DC), 656
Aortic
  and arterial segments, Teflon in replacement of, 389
  aneurysms, abdominal, intact and ruptured, 176
Appendicitis due to gallstones, 120
Appendix, adenocarcinoma of, 630
Arterial
  and aortic segments, Teflon in replacement of, 389
  blood Ph, indication for measurement of, 352
  reconstruction by endarterectomy, 165
  prostheses, 690
Arteries
  clip for temporary occlusion of cerebral, 587
  renal, hypertension caused by fibromuscular hyperplasia of, 183
Arteriomesenteric duodenal compression, 262
Artery, aberrant subclavian division of (CAC), 137
Arthritis, degenerative, of lumbar intervertebral joints, 313
Atelectasis, postoperative, pancreatic dornase aerosol in, 447
Autotransplantation of spleen following traumatic rupture, 693

Bacterial flora of gastric stump, 663
Bile duct, common, massive hemorrhage from due to T tube, 623
Biliary tract, extrahepatic, rupture of, following blunt abdominal trauma, 107
Billroth I gastric resection for chronic duodenal ulcer, 251
Bleeding diverticula of colon, management of, 217
Blood pH, arterial, indications for measurement of, 346
Bone grafting, anorganic, 12
Book reviews
  A Synopsis of Anesthesia. J. Alfred Lee. Williams & Wilkins Co., 152
  An Atlas of Normal Radiographic Anatomy. Isadore Mechan and R. M. F. Farrer-Meschan. W. B. Saunders Co., 152
  Arterial Embolism in the Limbs. A. L. Jacobs. Williams & Wilkins Co., 660
  Ciba Foundation Symposium on Carcinogenesis: Mechanisms of Action. Edited by G. E. W. Wolstenholme. Little, Brown & Co., 152
  Handbook of Physiology, Section I. Neurophysiology, Volume I. Editor in Chief, John Fields. Williams & Wilkins Co., 660
  Surgery of the Ear. George E. Shambaugh, Jr. W. B. Saunders Co., 660
  The Truth about Your Eyes. Derrick Vail. Farrar, Straus & Cudahy, 660
Bowel
  small, recticulum cell carcinoma of, 602
  spontaneous perforation of, in newborn, 54
Brain, regional hypothermia and its effect on, 43
Breast and hamartomatous hypothalamic malformation, carcinoma of, 606
  granular cell myoblastoma of, 98
  lesions, diagnosis of, from frozen section (E), 661

Buccal mucosa, squamous cell carcinoma of, 539
Burns
  deformity of hand, (CAC), 802
  etiology of and mortality from, at general hospital, 381
  local care of, 68

Café-au-lait spot, melanoma developing from, 129
Cancer
  deposition and retention of tetracycline in, 384
  quackery, 808
Carcinoma
  of breast with hamartomatous hypothalamic malformation, 606
  of palate, 530
  of rectum, combined abdominal and perineal resection for, 194
  of upper jaw and antrum, 401
  of uterus, 522
  persistent, 620
  primary, of gallbladder, 365
  squamous cell, of buccal mucosa, 539
  ulcerogenic non-beta cell pancreatic islet, 48
  vesical, complete regression following urinary diversion, 133
Cardiac
  arrest during anesthesia, physiologic basis for, 354
  output in dogs during cardiac massage, 64
Central nervous system, fluid replacement and cerebral edema in surgical lesions of, 303
Cerebral
  arteries, clip for temporary occlusion of, 587
  edema and fluid replacement in surgical lesions of central nervous system, 303
Chemodectoma, 747
Chest
  penetrating injuries to, 709
  severe non-penetrating injuries to, 715
  wall, desmoid tumors of, 126
Children
  polyps of colon and rectum in, 551
  Thiersch's operation for rectal prolapse in, 457
  treatment of mandibular condyloid process fracture in, 835
Cholecystitis, acute non-calculous, in children, 103
Cholecystostomy in aged, 544
Chlorpromazine jaundice (CAC), 495
Chondrosarcoma in phalanx, 751
Chorionepithelioma of stomach, 224
Chylothorax, postoperative, 8
Cleft lip and palate, early closure of, 869
Coarctation of aorta (DC), 656
Colon
  and rectum, polyps of, in children, 551
  ascending, acute diverticulitis of, 744
  bleeding diverticuli of, 217
  endometriosis of, 381
  hemorrhage of, 600
Colon
  right and transverse, esophageal replacement using, 71
  sigmoid, diverticulitis of, 206
Commissurotomy, mitral valvular, 512
Court cases, surgery, 143, 498, 651, 789
Cutaneous and intestinal neurofibromatosis, 761
Cyst, epidermoid, of spleen, 475

Dactylolysis spontanea (ainhum), 480
Deformity, burn, of hand, (CAC), 802
Deglutition and phonation, cinefluorographic studies of, 864
Dermoid, ruptured intracranial, 723
Desmoid tumors of chest wall, wide block excision and repair with stainless steel wire mesh, 126
Diagnostic corner, 148, 500, 656, 798
Disc protrusions, lumbar, operations for, 434
Dislocation,
  chronic, of shoulder, excision of the acromial process for, 91
  recurrent, of shoulder, 423
Diverticuli, bleeding, of colon, 217
Diverticulitis
  acute, of ascending colon, 744
  of sigmoid colon, surgical treatment of, 206
Diverticulum, solitary jejunal, hemorrhage from, 597
Dornase aerosol, pancreatic, in postoperative atelectasis, 447
Drape, transparent plastic surgical, 590
Ductus choledochus, surgical exploration of, 94
Duodenal compression, arteriomesenteric, 262
Dupuytren's contracture, radical fasciectomy for, 372

Ear, middle, surgical reconstrnction of, 823
Ectopic presacral kidney, 148
Edema, cerebral, and fluid replacement in management of surgical lesions of central nervous system, 303
Editorials
  Diagnosis from frozen section in lesions of breast, 661
  Holes in rubber gloves, 363
  Intensive nursing care, 1
  Let's look at the record, 4
  Palliative surgery for advanced malignancy, 511
Embolism, fat, and a fat center, 676
Endarterectomy, arterial reconstruction by, 165
Endocrine tumors, associated with peptic ulceration, 764
Endometriosis
  enigma of, 122
  of colon, 381
Epidermoid cyst of spleen, 475
Esophagus
  atresia of, and imperforate anus (CAC), 140
  lye stricture of, 71
  replacement of, with right and transverse colon, 71
  replacements of, 278
Ethylenediamine extraction, clinical experiences with heterografts processed by, 12

Extracorporeal circulation with heat exchanging filming oxygenator, elective hypothermia during, 338
Extremity
lower, amputations of, in peripheral vascular disease, 682
lymphangiosarcoma of, with chronic lymphedema, 617

Fasciectomy for Dupuytren's contracture, 372
Fat embolism and fat center, 676
Femur, primary reticulum cell sarcoma of, 753
Fibroids, uterine, sarcomas developing in, 416
Fibromuscular hyperplasia of renal arteries, hypertension caused by, 183
Fistula, recurrent tracheoesophageal, 110
Fluid replacement and cerebral edema in management of surgical lesions of central nervous system, 303
Fracture
compound Colles, gangrene following, 124
mandibular subcondylar, onlay-inlay metal splint for immobilization of, 845
of mandibular condyloid process in children, treatment of, 835
Frozen section in lesions of the breast (E), 661
Full-thickness skin grafts, pedal, repair of contractures of hand with, 412
Fungemia, monilia albicans, following multiple pelvic and abdominal procedures treated with Amphotericin B, 470

Gallbladder
appendicitis due to stones of, 120
perforation of, 407
primary carcinoma of, 365
Gangrene following compound Colles fracture, 124
Gastric
heterotopia, 396
resection, Billroth 1, for chronic duodenal ulcer, 251
stump, bacterial flora of, 663
Gastrointestinal hemorrhage in aged, 258
Geriatric patients with head and neck problems, 813
Gloves, rubber, holes in (E), 363
Goiter, substernal and intrathoracic, preservation of airway in surgery for, 85
Graft
anorganic bone, 12
pedal full-thickness skin, repair of contractures of hand with, 412
Granular cell myoblastoma of breast, 98
Groin, hernias of, 462

Hamartomatous hypothalamic malformation and carcinoma of breast, 606
Hand,
management of burn deformity of (CAC), 802
Hand,
repair of contractures of, with pedal full-thickness skin grafts, 412
tumors of, 293
Head and neck problems, treatment of geriatric patients with, 813
Heart, surgical procedures to revascularize, 572
Hemangioma, cavernous, of striated muscle, 593
Hemangiopericytoma of ligamentum teres of liver, 740
Hemoperitoneum, in newborn, 117
Hemorrhage
colonic, 600
from solitary jejunal diverticulum, 597
gastrointestinal, in aged, 258
massive, from common bile duct to T tube, 623
pulmonary (CAC), 490
Hemostasis in retropubic prostatectomy, 465
Hemostatic agent, surgical absorbable, 439
Hepatorenal syndrome, 431
Hernia
hiatus (DC), 798
of groin, preperitoneal hernial repair for, 234
spigelian or spontaneous lateral ventral, 515
treatment of, 462
Herniorrhaphy, inguinal, local anesthesia for, 782
Heterotopia, gastric, 396
Hiatus hernia (DC), 798
Hyperparathyroidism associated with intrathyroid parathyroid gland, 757
Hypertension caused by fibromuscular hyperplasia of renal arteries, 183
Hypertrophy, prostatic, obstructive uropathy due to (CAC), 643
Hypotension and hypothermia for intracranial surgery during pregnancy, 633
Hypothalamic malformation, hamartomatous, carcinoma of breast in young woman with, 606
Hypothermia
and hypotension for intracranial surgery during pregnancy, 633
deep, for intracardiac surgery, 332
elective, during extracorporeal circulation with heat exchanging filming oxygenator, 338
regional, and its effect on brain, 43

Ileocolic intussusception (DC), 500
Imperforate anus and esophageal atresia (CAC), 140
Implant reconstruction of orbit, 674
Infants and children, Thiersch's operation for rectal prolapse in, 457
Inguinal herniorrhaphy, local anesthesia for, 782
Interatrial defects, repair of, through right anterolateral thoracotomy, 455
Intestinal
and cutaneous neurofibromatosis, 761
decompression tubes, siliconizing, 584
obstruction, mechanical, as late complication of mucoviscidosis, 113
Intracardiac surgery, deep hypothermia in, 332

Intracranial
dermoid, ruptured, 723
surgery during pregnancy, hypothermia and hypotension for, 633
Intussusception, ileocolic (DC), 500
Ischemia, Volkmann's, 635

Jaundice, chlorpromazine (CAC), 495
Jaw and antrum, squamous cell carcinoma of, 401
Jejunal diverticulum, solitary, hemorrhage from, 597
Jejunum, proximal, traumatic rupture of, 731
Joints, lumbar intervertebral, degenerative arthritis of, 313

Kidney, ectopic presacral, 148

Ligamentum teres of liver, hemangiopericytoma of, 740
Lip and palate, cleft, early closure of, 869
Liver
bleeding from, in newborn, 117
hemangiopericytoma of ligamentum teres, 740
Lumbar
disc protrusions, operations for, 434
intervertebral joints, degenerative arthritis of, 313
Lye stricture of esophagus, replacement using right and transverse colon, 71
Lymphangiosarcoma of lower extremity and chronic lymphedema, 617
Lymphedema, chronic, lymphangiosarcoma of lower extremity with, 617

Malignancy, advanced, palliative surgery for (E), 511
Mandible
asymmetry of, 825
condyloid process fracture in children, treatment of, 835
osteogenic sarcoma of, 613
subcondylar fractures, onlay-inlay metal splint for immobilization of, 845
Melanoma developing from café-au-lait spot, 129
Meningioma, extracranial, presenting as tumor of neck, 486
Mineralocorticoid excess, primary aldosteronism, 158
Monilia albicans fungemia following multiple pelvic and abdominal procedures treated with Amphotericin B, 470
Mortality from and etiology of burns at general hospital, 375
Mucoviscidosis, mechanical intestinal obstruction as late complication of, 113
Muscle, striated, cavernous hemangioma of, 593
Myoblastoma, granular cell, of breast, 98

Neck
and head problems, treatment of geriatric patients with, 813
extracranial meningioma presenting as tumor of, 486
Neoplasms, benign, of stomach, 561
Nervous system, central fluid replacement and cerebral edema in management of surgical lesions of, 303
Neurofibromatosis, cutaneous and intestinal, 761
Newborn
hemoperitoneum in, 117
spontaneous perforation of bowel in, 54
Non-beta cell pancreatic islet carcinoma, ulcerogenic, 48
Nursing care, intensive (E), 1

Obstruction, mechanical intestinal, as late complication of mucoviscidosis, 113
Occlusion of cerebral arteries, temporary, clip for, 587
Orbit, implant reconstruction of, 818
Our surgical heritage
Cheselden, William, 655
Eve, Paul Fitzsimmons, 505
Heister, Lorenz, 147
Morgan, John, 653
Petit, Jean Louis, 797
Post, Wright, 145
Pott, Percivall, 507
Output, cardiac, in dogs during cardiac massage, 64
Oxygenator
experimental and clinical use without, in deep hypothermia for intracardiac surgery, 332
new heat exchanging filming, for elective hypothermia during extracorporeal circulation, 338

Palate
and lip, cleft, early closure of, 869
carcinoma of, 530
Pancreas, pseudocysts of, 30
Pancreatic
dornase aerosol in postoperative atelectasis, 447
islet carcinoma, ulcerogenic non-beta cell, 48
Parathyroid glands, intrathyroid, hyperparathyroidism associated with, 757
Parotid gland
acinic cell adenocarcinoma of, 639
tumors of deep lobe of, 323
treatment of, 805
Pedal full-thickness skin grafts, repair of contractures of hand with, 412
Pelvic and abdominal procedures, monilia albicans fungemia following, treated with amphotericin B, 470
Peptic ulceration with associated endocrine tumors, 764
Perforation, spontaneous, of bowel in newborn, 54
Perineal and abdominal resection, synchronous, of rectum for carcinoma, 194
Peripheral vascular disease, lower extremity amputation in, 682
pH of arterial blood, indication for measurement of, 352
Phalanx, chondrosarcoma of, 751

Phonation and deglutition, cinefluorographic studies of, 864
Physiologic basis of cardiac arrest during anesthesia, 354
Polyps of colon and rectum in children, 551
Postoperative complications, 358
Pregnancy, hypothermia and hypotension for intracranial surgery during, 633
Presidential address, Pacific Coast Surgical Association, 153
Prolapse, rectal, in infants and children, Thiersch's operation for, 457
Prostatectomy
  retropubic, hemostasis in, 465
  vesicocapsular, 672
Prostatic hypertrophy, obstructive uropathy due to (CAC), 643
Prostheses
  arterial, 690
  vascular importance of porosity in, 557
Pseudocysts of pancreas, 30
Psychosis, postoperative, in aged, 38
Pulmonary hemorrhage, massive, 49
Pyloroplasty and vagotomy for acute perforated duodenal ulcer, 245

Record, let's look at (E), 4
Rectum
  and colon, polyps of, in children, 551
  prolapse of, in infants and children, Thiersch's operation for, 457
  synchronous abdominal and perineal resection for carcinoma of, 194
Renal arteries, fibromuscular hyperplasia of, hypertension caused by, 183
Reticulum cell sarcoma
  of small bowel, 602
  primary, of femur, 753
Retractor, self retaining spermatic cord, 589
Rubber gloves, holes in (E), 363
Rupture
  immediate and delayed, of extrahepatic biliary tract following blunt abdominal trauma, 107
  traumatic, of proximal jejunum, 731

Sarcoma
  developing in uterine fibroids, 416
  osteogenic, of mandible, 613
  primary reticulum cell, of femur, 753
  reticulum cell, of small bowel, 602
Serum amylase, rapid screening test for, 5
Shoulder
  chronic dislocation of, excision of acromial process for, 91
  recurrent dislocation of, 423
Sigmoid colon, diverticulitis of, 206
Siliconizing intestinal decompression tubes, 584
Skin grafts,
  pedal full-thickness, repair of contractures of hand with, 412
Spermatic cord
  retractor, self retaining, 589
  torsion of (CAC), 648
Spigelian or spontaneous lateral ventral hernia, 515
Spleen
  autotransplantation of, following traumatic rupture, 693
  epidermoid cyst of, 475
Splint, onlay-inlay metal, for immobilization of mandibular subcondylar fractures, 845
Spondylolysis, traumatic, 698
Squamous cell carcinoma
  of buccal mucosa, 539
  of upper jaw and antrum, 40
Staphylococcal infections in general hospital, suggested method for control of, 534
Sternotomy, median, using transverse submammary skin incision, 779
Stomach
  benign neoplasms of, 561
  chorionepithelioma of, 224
  duplications of, 59
Striated muscle, cavernous hemangioma of, 593
Subclavian artery, aberrant, division of (CAC), 137

Tape, nonirritating, multipurpose surgical adhesive, 789
Teflon in replacement of aortic and arterial segments, 389
Test, rapid screening, for serum amylase, 5
Tetanus, postoperative, 737
Tetracycline, deposition and retention of, in cancer, 384
Thiersch's operation for rectal prolapse in infants and children, 457
Thoracotomy, right anterolateral, repair of interatrial defects through, 455
Torsion of spermatic cord (CAC), 648
Tracheoesophageal fistula, recurrent, 110
T tube, massive hemorrhage from common bile duct due to, 623
Tumors
  chest wall, desmoid, wide block excision and repair with stainless steel wire mesh, 126
  deep lobe, of parotid gland, 323
  endocrine, associated peptic ulceration, 764
  of hand, 293
  of neck, extracranial meningioma presenting as, 486
  parotid, treatment of, 805

Ulcer
  acute perforated duodenal, vagotomy and pyloroplasty for, 245
  chronic duodenal, Billroth 1 gastric resection for, 251
  peptic, with associated endocrine tumors, 764

Ulcerogenic non-beta cell pancreatic islet carcinoma, 48
Urinary diversion, complete regression of vesical carcinoma following, 133
Uropathy, obstructive, due to prostatic hypertrophy (CAC), 643
Uterus
  carcinosarcoma of, 522
  fibroids of, sarcomas developing in, 416

Vagotomy and pyloroplasty for acute perforated duodenal ulcer, 245
Vascular prostheses, importance of porosity in, 557
Veins, major, management of injuries to, 171
Vesicoureteral reflux, significance of, 527
Volkmann's ischemia, 635

Wringer injury (CAC), 646

THE AMERICAN JOURNAL OF SURGERY

Three Year Cumulative Index

of

AUTHORS

and

SUBJECTS

Volumes 95–100 January 1958–December 1960

Three Year Authors' Index

Volumes 95–100 January 1958–December 1960

Authors' Index, Volumes 95–100*

Abbott, J. P., 96: 12
Abbott, W. E., 99: 600
Abel, M. S., 97: 530; 99: 717
Abrams, J. S., 97: 17
Abramson, D. J., 98: 730
Abramson, W., 96: 718
Accinno, M. A., 100: 91
Acquarelli, M. J., 96: 571
Adams, B. E., 98: 248
Adams, R. M., 98: 248
Adcock, R., 96: 387
Adler, F., 99: 821
Adson, M. A., 95: 885
Agrawal, S., 96: 506
Allansmith, R., 96: 353
Allen, J. E., 100: 648
Al-Naaman, Y. D., 98: 735; 99: 320
Alonso-Lej, F., 99: 80
Alrich, E. M., 99: 33
Ambrus, L., 97: 113
Amerson, J. R., 95: 878
Anderson, A. A., 100: 761
Anderson, L., 99: 762
Anderson, M. C., 97: 260
Anderson, R. E., 95: 445; 96: 530
Andrews, N. C., 100: 490
Annamunthodo, H., 99: 951
Annan, C. M., 97: 69
Ansbro, F. P., 95: 953
Ansingh, H., 100: 358
Aquino, J., 97: 698
Arcari, F. A., 97: 471
Archambault, H. A., 95: 976; 97: 782
Archambault, R., 95: 976; 97: 782
Arcomano, J. P., 96: 703
Armitage, G. L., 96: 580
Armitage, H. V., 96: 580
Arnspiger, L. A., 100: 103
Aronson, S. G., 97: 225
Artz, C. P., 95: 651
Ashley, F. L., 98: 217; 100: 864
Atkins, R. A., 99: 326
Aufricht, G., 95: 231

Bagby, G. W., 95: 761
Badame, J. M., 98: 756
Badgley, C. E., 98: 432
Bahnson, H. T., 96: 477
Baker, H. W., 100: 323
Baker, J. W., 98: 304
Baker, T. J., Jr., 96: 84
Baker, W. H., 99: 538
Barker, W. F., 100: 165
Barnes, F. E., Jr., 95: 1013
Barnes, J. E., 99: 374
Barnes, N., 98: 116
Barnett, J. C., 96: 703
Barnett, W. O., 96: 387, 679
Baron, H., 98: 34
Baronofsky, I. D., 99: 512
Barrette, W. C., 96: 559
Barsky, A. J., 95: 287
Barss, J. A., 97: 316
Bartels, W. W., 98: 760
Bartenbach, G. E., 100: 43
Basile, J. X. R., 100: 434
Bass, J. A., 95: 309
Bate, J. T., 95: 854; 97: 90
Baum, R. K., 99: 904
Beahrs, O. H., 95: 885; 100: 813
Beal, J. M., 97: 36, 251; 98: 584; 100: 1, 561
Beall, A. C., Jr., 99: 770, 775
Beare, R. L. B., 95: 197
Beattie, A. S., 98: 236
Beavis, J. O., 98: 816
Bechtol, C. O., 100: 124
Beck, C. S., 95: 743
Beck, W. C., 100: 363
Becker, A., 100: 43
Behrend, A., 95: 455
Bell, H. Glenn, 96: 133; 97: 1
Bell, Hugh George, 97: 54; 100: 416
Bell, J. L., 98: 923
Bell, J. W., 99: 364; 100: 757
Benaim, F., 95: 267
Benioff, M. A., 97: 368
Benjamin, H. B., 100: 43
Bennett, G. E., 98: 484
Bentley, F. H., 96: 193
Bergera, J. J., 99: 318
Berghan, R., 96: 27
Bergin, W. F., 98: 612
Bergner, L. H., 100: 480
Berman, J. K., 97: 98
Berne, C., 100: 153
Berne, C. J., 98: 1; 100: 346
Bernhard, W., 95: 239
Bethea, H., 95: 299
Bettman, A. G., 97: 297
Bhadkamkar, A. R., 98: 107
Bhatt, V. P., 98: 107
Bickell, W. H., 100: 698
Bigelow, N. H., 96: 61
Billig, H. E., Jr., 95: 81
Bilton, J. L., 100: 764
Binkley, F. M., 96: 213
Bisca, B. V., 96: 360
Biskind, G., 97: 368; 100: 126
Black, A., 95: 471
Black, B. M., 95: 395; 96: 613
Blaisdell, P. C., 96: 401
Blake, K., 100: 396
Blank, R. H., 99: 33
Bliven, F. E., Jr., 95: 617
Block, R. E., 95: 487
Blocker, T. G., 95: 309; 97: 597, 604; 99: 609; 100: 805
Blocker, V., 97: 604
Bloom, W. L., 97: 593
Blundell, A. E., 95: 953
Blunt, J. W., Jr., 95: 512; 97: 415
Bobrow, M. L., 95: 938
Bodon, G. R., 97: 217
Boggino, J., 96: 640
Boggs, J., 97: 229
Boldrey, E., 100: 633
Boles, E. T., Jr., 99: 870
Boley, S. J., 96: 122
Bond, J. W., 99: 90
Bonilla, K. B., 97: 772; 100: 731
Borkenhagen, R., 96: 848; 98: 796
Bottone, J. J., 96: 703
Bowe, J. J., 99: 847
Bowers, W. F., 97: 772; 98: 664; 99: 908; 100: 110, 731
Boyden, A. M., 100: 206
Boyer, J. L., 100: 71
Boyle, J. F., 100: 346
Boysen, A. M., 99: 908
Bradford, B., Jr., 97: 229
Bradham, R. R., 100: 557
Bradley, R. L., 97: 718
Bradshaw, J. S., 99: 600
Bramson, M. L., 100: 338
Braunstein, P. W., 97: 494, 522; 99: 766
Brav, E. A., 95: 752; 100: 423
Breidenbach, L., 96: 522
Brewer, L. A., III, 96: 137
Brickley, H. D., 100: 107
Briggs, N. M., 98: 196

* Numbers followed by a colon indicate volumes; all other numbers represent folios.

Brill, N. R., 99: 247
Britt, C. I., 100: 490
Britton, R. C., 97: 141
Brizzolara, L. G., 95: 873, 1007; 96: 151; 98: 753
Broccolo, E., 100: 107
Bromberg, B. E., 96: 827; 98: 880; 100: 818
Bronsther, B., 98: 603
Brooks, J. R., 99: 588
Brown, A. L., 96: 559
Brown, C. R., 95: 986
Brown, H. J., 99: 228
Brown, J. B., 97: 418
Brown, K. L., 95: 695, 980; 99: 309
Brown, L. B., 99: 934
Brown, M. E., 100: 48
Brown, N., 98: 631
Brunschwig, A., 97: 148
Bruwer, A. J., 95: 636
Bryan, R. S., 96: 654
Buchanan, D. P., 97: 336
Buchanan, E. B., 100: 620
Bukovnic, J. A., 97: 454
Bullen, B., 98: 343
Bunnell, I. L., 97: 407
Bunnell, S., 95: 168
Bunstock, W. H., 95: 822
Burch, R. J., 100: 825
Burghele, T., 97: 108
Burke, J. F., 95: 828
Burlington, H., 95: 581
Burnham, P. J., 97: 331
Burns, A., 99: 326
Burrus, G., 99: 40
Butcher, H. R., Jr., 95: 25
Butler, D. B., 99: 266
Butler, E. D., 100: 293
Butler, F. S., 96: 780
Butterworth, T. R., 99: 817
Byrd, B. F., Jr., 97: 232
Byrne, J. J., 95: 102, 335, 371; 97: 131, 156; 99: 133, 168; 100: 98

Cabrera, A., 100: 551
Callahan, J. J., 99: 814
Cameron, A. B., 99: 307
Cammack, K. V., 96: 615; 99: 713, 100: 54
Cammock, E. E., 100: 757
Campbell, R. D., Jr., 95: 599; 97: 634; 99: 745
Canter, J. W., 99: 512
Cantor, M. O., 100: 584
Carey, J. M., 96: 696
Carlson, E., 99: 352
Carney, W. I., 97: 274
Carpenter, W. S., 95: 914
Carroll, R. E., 97: 477
Carry, E. J., 99: 236
Carter, J. G., 98: 91
Carter, J. V., 95: 953
Carter, R., 96: 379; 98: 175, 271; 100: 262
Cartwright, R. S., 99: 885
Casberg, M. A., 95: 493; 97: 597
Case, T. C., 95: 51, 869; 96: 129; 99: 898
Caserta, J. A., 97: 69
Castigliano, S. G., 97: 698
Catsaras, H. C., 97: 360
Cavanagh, D., 99: 80
Caylor, H. D., 96: 675
Celano, E. R., 97: 344
Chambers, F. W., 98: 830
Chambers, R. G., 100: 613
Chandler, R., 95: 315
Charache, H., 100: 522
Chatterton, C. C., 96: 654
Chau, A., 97: 789
Chaudhry, A. P., 95: 923
Chesky, V. E., 99: 857
Chester, S. T., 96: 272
Child, C. G., III, 95: 366
Childs, W. A., 95: 411
Chomet, B., 97: 120
Clancy, C., 100: 737
Clarkson, P., 95: 315
Clatworthy, H. W., Jr., 97: 255
Clayton, M. L., 98: 373
Cliffton, E. E., 100: 447
Clough, D. M., 100: 122
Cloward, R. B., 98: 722
Coates, J. B., Jr., 97: 687
Cobb, E. G., 100: 384
Codington, J. B., 97: 333
Coe, H. E., 97: 769
Coe, J. D., 99: 45
Coffey, R. J., 96: 820
Cohen, B., 95: 731; 96: 810
Cohn, C. H., 97: 563
Cohn, R., 98: 296; 100: 158, 258
Cole, W. H., 98: 544; 99: 206
Coleman, H. V., 95: 781
Coleman, J. M., 97: 69
Coleman, S. S., 97: 43
Coleman, W. O., 100: 475
Coley, B. L., 96: 479
Collier, C. S., 95: 967; 97: 321; 99: 48
Collins, E. M., 96: 749
Collins, H. A., 99: 40
Comarr, A. E., 95: 843; 97: 328
Compere, C. L., 96: 624
Compere, E. L., 96: 624
Condon, R. E., 100: 234, 544
Conn, J. H., 95: 106
Connell, B. F., 100: 747
Connell, J. F., Jr., 95: 684; 97: 429; 98: 31, 685
Connolly, J. E., 96: 107
Connolly, P. J., 95: 914
Conway, H., 95: 994
Coon, W. W., 98: 4
Cooper, D. R., 95: 946
Cooper, F. G., 97: 363
Cooper, T. J., 98: 623
Cope, O., 99: 394
Corbett, R. S., 96: 684
Corman, H. H., 96: 646
Cornell, W. S., 95: 477; 97: 709
Cosgriff, J. H., Jr., 97: 569
Cottrell, T. L. C., 100: 527
Coury, J. J., 97: 316
Couves, C. M., 95: 878; 100: 709, 745
Craig, H. R., 97: 675
Craig, T. V., 98: 775; 99: 424
Crane, J., 98: 290
Cranley, J. J., 95: 524
Craven, R. E., 100: 802
Crawford, E. S., 100: 22
Creech, O., 97: 756
Cremin, J. H., 100: 224
Crenshaw, W. B., 96: 319
Cressman, R. D., 98: 202
Crews, E. R., 100: 68
Crigler, C. M., 97: 756
Crikelair, G. F., 96: 631
Crile, G., Jr., 99: 533, 949
Crosthwait, R. W., 99: 330
Cruze, K., 100: 630
Crystal, D. K., 98: 265
Culiner, M., 100: 126
Culiner, M. M., 97: 368
Cullen, B. J., 95: 856
Curry, G. J., 95: 507, 518; 96: 615; 98: 517, 530; 99: 713

Dahlin, D. C., 96: 496; 99: 852
Dale, W. A., 98: 20
Dalitsch, W. W., 96: 771; 98: 869
Daron, P. B., 97: 793
Davidson, E., 97: 49
Davila, J. C., 98: 9
Davis, A. D., 95: 312
Davis, G. H., 99: 94
Davis, J. B., 96: 492; 98: 91
Davis, J. S., 97: 92
Davis, N., 98: 91
Davis, W. A., 97: 75
Davis, W. C., 99: 103
Day, S. W., 98: 265
De Bakey, M. E., 96: 12; 99: 40, 641, 775; 100: 22

de la Peña, A., 96: 590
De Lorenzo, A. G., 98: 555
de Lorimier, A. A., 100: 293
Dean, M. A., 100: 98
Deddish, M. R., 99: 188
Demergian, V., 95: 883
Denkewalter, F. R., 97: 238
Des Prez, J. D., 96: 763; 97: 421
DeStefano, N. M., 100: 122
DeVito, R. V., 98: 657
DeVoe, A. G., 98: 384
Dewar, F. P., 95: 555; 99: 283
Dickison, J. C., 97: 627
Diefenbach, W. C. L., 95: 866
Dillon, R. F., 96: 3
Dineen, P., 99: 292; 100: 470, 534
Dodds, M. E., 99: 713; 100: 54
Donhauser, J. L., 96: 61
Donovan, A. J., 95: 366
Dooling, J. A., 95: 577
Doremus, W. P., 96: 576
Drapanas, T., 99: 617
Draper, J. W., 99: 766
Drompp, B. W., 99: 733
Drucker, W. R., 97: 454
Dubrow, A. A., 100: 630
Duffy, J. J., 100: 434
Duncan, J. A., 98: 229
Dunn, F. S., 98: 821
Dunphy, J. E., 98: 55
Dunton, E. F., 97: 597
Duran, R. J., 100: 802
Dye, E. R., 98: 368
Dwyer, W. A., Jr., 95: 1004

Eade, G. G., 95: 309
Eaker, A. B., 95: 31
Earle, A. S., 100: 782
East, W. M., 99: 6
Eastwood, D. W., 96: 102
Ebert, R. V., 97: 593
Echeverría, A, E., 98: 695
Ecker, H. A., 96: 815; 98: 826
Eckman, W. G., 96: 718
Economy, D., 99: 646
Eddy, W., 96: 396
Eddy, W. A., 96: 448
Edgehill, H., 100: 416
Edinburgh, A., 96: 66
Edwards, E. A., 99: 837
Edwards, J. W., 98: 217
Ehrlich, R., 95: 826
Eisen, J., 99: 249
Eisen, M. E., 95: 438
Eitzen, O., 98: 750
Elam, J. O., 97: 407
Elkan, W., 96: 458
Elliott, D. W., 96: 604
Elliott, H. B., 100: 54
Ellison, E. H., 97: 17; 99: 393, 497; 100: 511
Engstrom, W. W., 99: 580
Enterline, H. T., 96: 372
Epsteen, C. M., 96: 745
Erb, W. H., 100: 30
Erich, J. B., 96: 496; 98: 677; 99: 852; 100: 401, 539
Erskine, J. M., 97: 270
Erskine, L. A., 97: 667
Estes, W. L., Jr., 97: 379
Etheredge, S. N., 100: 200
Evers, J. L., 97: 407

Faggella, M. L., 96: 696
Faggella, R. M., Jr., 99: 283
Falk, S., 100: 597
Fansler, T., 95: 715
Farmer, A. W., 95: 274
Farrell, J. J., 100: 690
Farris, J. M., 98: 236
Feigen, G. M., 100: 194
Felder, M. E., 98: 95
Felix, A. J., 97: 49
Fell, E. H., 96: 3; 99: 265; 100: 8
Ferguson, L. K., 96: 515
Fernicola, A. R., 100: 465
Fett, H. C., Jr., 100: 753
Fieber, S. S., 95: 157
Fillis, B. E., 95: 856
Fineman, A. D., 95: 64
Finger, D. H., 99: 339
Fink, H., 97: 211
Finkle, A. L., 99: 23
Fisher, J. H., 99: 134, 137
Fitts, W. T., Jr., 97: 31, 253; 99: 762
Fitzgerald, J. B., 100: 22
Fitzgibbon, J., 96: 396
Flagg, P. J., 95: 729
Flom, R. S., 99: 941
Fogelman, M. J., 95: 501; 99: 694
Fomon, J. J., 99: 33
Foote, J. A., 98: 4
Foraker, A. G., 99: 1; 100: 4
Ford, J. R., 99: 878
Ford, H. S., 96: 338
Forsythe, W. E., 97: 558
Fountain, E. B., 99: 908
Fox, C. L., Jr., 99: 690
Fox, R. A., 100: 693
Frackelton, W. H., 98: 390
Francis, K. C., 97: 484; 100: 617
Fraser, M., 100: 646
Freeark, R. J., 100: 107
Freeman, W. A., 95: 415
French, J. D., 100: 354
French, S. W., III, 95: 31, 983; 96: 430
Friedman, M., 98: 211
Friedman, S., 95: 938
Friedmann, E., 96: 81
Friesen, S. R., 99: 420
Froede, R. C., 96: 420
Fryer, M. P., 97: 418
Fujiwara, O., 96: 663
Fuller, F. W., 97: 184
Furst, N. J., 95: 484
Furste, W., 99: 665

Gadboys, H. L., 98: 9
Gaffney, L. B., 95: 974
Gailitis, R. J., 99: 84
Galante, M., 96: 254
Gallagher, J. R., 98: 332
Gallagher, W. B., 100: 407
Gants, R. T., 95: 45
Garcia, A., 95: 593
Garcia, A., Jr., 99: 625
Garcia, E. N., 98: 217
Garfinkel, B., 95: 484
Garnes, A. L., 95: 415; 96: 545; 97: 49
Garvin, E. J., 96: 711
Garvin, W. J., 96: 735
Gaspar, M. R., 96: 202; 100: 171
Gaynor, W. C. T., 95: 866
Geever, E. F., 97: 749
Geffen, A., 96: 66
Geis, A. F., 99: 891
Geist, D. C., 96: 126
George, K., 97: 644
George, R. E., 98: 664
Georgiade, N., 95: 246
Georgiade, N. G., 98: 783
Gerard, F. P., 96: 705
Gerber, E., Jr., 99: 332
Gerber, M. L., 98: 598
Gerbode, F., 96: 221; 97: 270; 100: 338
German, J. D., 99: 103
Getzen, L. C., 98: 598
Gibbel, M., 97: 120
Gibbel, M. I., 99: 326
Gilbert, A. E., 96: 54; 99: 945
Gilbert, M., 97: 255
Giles, E. J., 95: 429
Gimbel, N. S., 99: 676
Ginsberg, M., 96: 689
Gitlin, G., 97: 777
Gitlitz, G. F., 100: 439
Glanz, S., 100: 412
Glass, H., Jr., 99: 788
Glenn, F., 97: 3; 99: 449
Glover, D. M., 95: 679
Glover, R. P., 98: 9
Goddard, J. L., 95: 718
Goin, J. M., 98: 290
Golden, T., 95: 828; 100: 788

Goldenberg, M., 99: 679
Goldman, L., 98: 283
Goldowsky, S. J., 97: 274
Goldstein, J., 97: 108
Gomez, A. C., 100: 613
Goodsitt, E., 100: 764
Gordon, A. S., 100: 332
Gordon, C. A., 98: 41
Gordon, E. T., 98: 105
Gordon, R. E., 98: 41
Gordon, S. D., 95: 263
Gordon, S. K., 95: 862; 99: 244
Gorham, W., 99: 369
Gorlin, R. J., 95: 923
Gowing, D., 98: 55
Graf, C. J., 100: 587
Grafe, W., 100: 561
Graham, J., 98: 116
Graham, J. E., 97: 604
Grantham, A. W., 95: 856
Grassi, J. E., 100: 606
Gray, A. R., 100: 709, 715
Gray, G. H., 95: 304
Green, B. E., Jr., 98: 706
Green, R. E., 96: 721
Greene, D. G., 97: 407
Greenwood, G. J., 100: 823
Greer, A. E., 96: 696
Greig, J. H., 99: 817
Grier, W. N. R., 97: 789
Griffin, E. H., 96: 705
Griffith, B. H., 95: 994
Grillo, E. B., 98: 34
Grimes, E. L., 100: 30
Grimes, O. F., 100: 278, 602
Grisolia, A., 98: 760
Grodsky, L., 95: 474
Gross, S. W., 96: 462
Grossi, C. E., 100: 447
Gruhn, J., 99: 358; 100: 396
Gryska, P. F., 96: 12
Guisto, D. F., 95: 873, 1007
Gumport, S. L., 97: 225
Gurdjian, E. S., 95: 545
Gurney, C. E., 95: 301
Gustavson, R. G., 96: 343

Haas, A., 95: 87
Haas, S. L., 95: 125
Hagland, L. A., 98: 746
Hahn, E., 100: 864
Hainline, A., Jr., 100: 5
Hale, H. W., Jr., 97: 569; 99: 617
Hall, D. P., 97: 807; 98: 128, 646, 779; 99: 127, 257, 386, 974; 100: 145, 505, 653, 797
Hamandi, W. J., 100: 381
Hamill, J. P., 100: 293
Hampton, O. P., Jr., 98: 534
Hanafee, W., 100: 864
Hanlon, C. R., 100: 779
Hannon, J. L., 95: 31
Hansen, F., 96: 763
Hardin, C. A., 99: 809
Hardin, J. C., Jr., 97: 300
Hardy, J. D., 95: 106; 99: 433
Hardy, W. G., 95: 545
Harkins, G. A., 100: 338
Harkins, H. N., 96: 438; 98: 657; 100: 234
Harkness, J. T., 98: 328
Harless, M. S., 100: 515
Harmon, P. H., 95: 527; 97: 649; 99: 717
Harper, H. A., 96: 172
Harrigan, W. F., 96: 780
Harris, L. E., 95: 636
Harrison E. G., Jr., 100: 539
Harrison, J. H., 95: 3, 16; 99: 562
Harrison, W. H., Jr., 100: 709, 715
Hart, J., 100: 165
Haseeb, A. H., 97: 796
Hawley, P. R., 98: 519
Haycock, C. E., 97: 75
Hayes, J. T., 98: 432
Haymond, G. M., 97: 98
Haynes, B. W., Jr., 99: 684
Hazledine, H. J., 97: 316
Head, M., 96: 841; 98: 875
Heifetz, C. J., 96: 405
Heimbecker, R. O., 99: 918
Hellwig, C. A., 99: 857
Henderson, J., 100: 439
Hendrick, J. W., 97: 92
Hepps, S. A., 100: 64
Hernandez, W. E., 95: 953
Herrmann, S. F., 96: 281
Hershey, C. D., 96: 369
Hewlett, T. H., 98: 664
Heydinger, D. K., 97: 63
Hibner, R., 96: 309, 98: 296
Hicken, N. F., 97: 173
Higinbotham, N. L., 96: 479
Hilf, R., 97: 205
Hill, G. J., II, 99: 588
Hill, J. T., 100: 630
Hill, L. D., 98: 304
Hilst, W. D., 99: 702
Hinds, E. C., 98: 787; 100: 825
Hinshaw, D. B., 98: 175, 271; 100: 245
Hinton, J. W., 97: 789
Hirsch, J. E., 100: 515
Hirsch, S., 95: 853
Hoagland, P. W., 99: 908
Hoar, C. S., Jr., 100: 486
Hodge, J., 96: 428; 99: 369
Hodgson, P. E., 98: 4
Hoerner, M. T., 96: 47
Hoerr, S. O., 99: 4; 100: 5
Hoffman, B., 96: 768
Hoffman, E., 96: 33; 98: 99
Hoffman, W., 96: 88
Holderman, W. D., 98: 593
Holden, W. D., 97: 454
Holdren, R. F., 99: 938
Holinger, P. H., 97: 513
Holmes, E. M., 96: 833
Holsey, W. F., Jr., 96: 565
Hood, L. T., 98: 91
Horner, R. L., 97: 236
Hornick, E. J., 96: 646
Hosay, J. J., 100: 672
Hosler, R. M., 97: 739
Housepian, E. M., 98: 733
Howard, J. M., 95: 878; 97: 593; 99: 679; 100: 709, 715
Howard, M. A., 100: 217
Hoye, S. J., 100: 486
Hritzo, R. J., 99: 100
Hubay, C. A., 97: 454
Hubbard, T. B., Jr., 100: 600
Hubbell, D. S., 95: 990
Hudock, J. J., 96: 584
Hudson, O. C., 95: 74
Huebner, G. D., 97: 336
Hughs, C. W., 100: 110
Hume, D. M., 99: 458
Hunt, C. J., 95: 404
Hunt, W. E., 96: 698
Hunter, J. A., 97: 702
Hurd, G. B., 99: 309
Hurley, L. A., 97: 721; 100: 12
Hurwitt, E. S., 100: 439, 512
Huston, C., 95: 445
Hutchin, P., 100: 623
Hutchinson, W. B., 100: 251
Hyams, V. J., 99: 960

Ihrig, H. K., 100: 43
Impink, R. R., 97: 563
Ingham, D. E., 95: 659
Ioachim, H., 97: 108
Ippolito, C., 96: 810
Irmscher, G. W., 96: 716
Ivy, R. H., 95: 180
Izant, R. J., Jr., 99: 870

Jackson, D. A., 95: 967; 97: 321; 99: 48
Jackson, J. L., 98: 664
Jackson, P. P., 98: 184
Jackson, R. W., 97: 543
Jacob, S. W., 98: 55
Jacobson, H., 97: 604
Jacobson, P., 96: 550

Jaffee, S. R., 99: 68
Jahr, J., 95: 577
James, A. G., 96: 24
James, C. L., 96: 18
James, L. R., 98: 91
Jamplis, R. W., 98: 202
Janes, J. M., 95: 761
Janelli, D. E., 95: 142
Jay, J. B., 95: 45
Jeck, H. S., 96: 411
Jefferson, N. C., 99: 57
Jenny, J., 99: 762
Jensen, G. L., 95: 813
Jergesen, F., 98: 136
Joergenson, E. J., 98: 175; 100: 262
Johns, W. A., 99: 817
Johnston, C. G., 95: 489, 659, 914; 98: 566; 99: 651
Johnston, J. B., 100: 338
Johnston, K. C., 97: 513
Jones, H. W., Jr., 95: 304
Jones, J. C., 100: 332
Jones, J. S., 97: 756
Jones, S. A., 100: 262
Jordan, P. H., Jr., 98: 612
Jorgenson, N. C., 99: 945
Juca, W., 99: 106
Juncker, A., 100: 693

Kahn, E., 99: 679
Kalani, H. L., 98: 750
Kane A. A., 97: 211
Kaplan, A., 100: 107
Kaplan, D., 95: 160
Kaplan, I. W., 95: 668
Kapp, R. W., 95: 163; 98: 750
Karl, R., 99: 449
Katz, R. I., 95: 102
Kavanagh, F. J., 98: 363
Kawakita, H., 96: 663
Kazanjian, V. H., 95: 185; 96: 833
Keast, R. W., 98: 506
Keffler, R. A., 97: 79
Kelley, D. J., 100: 597
Kelley, H. G., Jr., 98: 772
Kelley, R. M., 99: 538
Kenner, G., 100: 117
Kent, E. M., 99: 885
Kepes, E. R., 95: 787
Kepes, J., 95: 246
Kerin, R. J., 97: 634
Kern, A. B., 99: 301
Kicos, J. E., 95: 932
Kiehn, C. L., 96: 763; 97: 421
Kilgore, E. S., Jr., 99: 636
Kilner, T. P., 95: 204
King, E. L., 96: 137
King, H. A., 97: 793
Kiriluk, L. B., 100: 251
Kirk, G. D., 95: 1015; 99: 233
Kiskadden, W. S., 95: 211
Kisner, P., 97: 241
Kissen, A. T., 100: 64
Klabunde, E. H., 95: 194
Klassen, K. P., 99: 827
Klaus, R. L., 98: 887
Klein, M. M., 97: 718
Klein, R. R., 96: 331
Klingenberg, P. H., 96: 713
Klug, T. J., 97: 713
Kluge, D. N., 99: 707
Knoernschild, H., 99: 665
Knuth, W. P., 95: 480
Koch, D. A., 97: 316
Kogure, T., 96: 479
Kokuga, H., 96: 663
Kolb, L. H., 95: 471
Kostrubala, J. G., 98: 915
Koucky, C., 99: 646
Kowal, R., 96: 848; 98: 796
Kragh, L. V., 96: 496; 98: 677; 99: 852; 100: 401, 539
Kraus, H., 98: 353
Kram, D. D., 97: 137
Kratzer, G. L., 100: 381
Krause, R. J., 95: 524
Krempin, H. O., 100: 103
Krippaehne, W. W., 96: 158
Kritchman, M., 96: 646
Kuhli, R., 98: 559
Kulowski, J., 95: 908
Kunz, H. G., 99: 13
Kurth, M. E., 96: 596

LaCaille, R. A., 95: 963
LaFave, J. W., 99: 941
Lai, S. P., 99: 821
Laird, E. G., 100: 129
Lam, R. C., 95: 150
Lamb, R., 95: 688
Lane, J. D., 97: 354
Lane, J. V., 96: 768
Lane, S. L., 96: 768, 776, 784, 810; 98: 904
Lanfranchi, R. P., 96: 787
Langston, R. G., 95: 294
Lapin, A., 95: 487
Larsen, B. J., 99: 228
Larsen, R. D., 97: 87, 471
Lary, B. G., 100: 690
Lasher, E. P., 96: 228
Lasker, S. E., 99: 690
La Sorte, A. F., 98: 631; 100: 593
Lategola, M. T., 96: 43
Lawrence, E. D., 95: 434
Leadbetter, W. F., 95: 341
Leavitt, D., 95: 154
Lebendiger, A., 100: 439
LeCompte, P. M., 100: 48
Leddy, W., 98: 243
Leeds, S. E., 96: 234; 98: 211
Leevy, C. M., 97: 132
Lega, J., 100: 551
Lehr, H. B., 99: 762
Lennon, E. J., 99: 580
Lenson, N., 97: 79
Levenson, S. M., 97: 749
Levey, S., 99: 600
Levi, A. A., 98: 739
Levin, M. N., 99: 77
Levin, W. C., 97: 597
Levitt, L. M., 100: 753
Levy, A. H., 96: 426
Levy, R. W., 95: 668
Lewis, G. K., 97: 283; 98: 928
Lewis, H., 99: 242
Lewis, J. J., 98: 12
Lewis, S. R., 95: 309
Lichtor, A., 95: 466; 98: 683
Lichtor, J., 95: 466; 98: 683
Lieberman, B., 100: 91
Lindem, M. C., 99: 228
Lindquist, H. D., 100: 617
Lindsay, W. R. N., 95: 555
Lindsey, D., 97: 582
Lippert, K. M., 95: 781
Lipscomb, A. B., 96: 393
Lipscomb, P. R., 96: 654
Liss, H. R., 97: 466
Listerud, M. B., 96: 438; 98: 657
Litton, L. O., 96: 660
Lloyd, F. A., 100: 527
Lloyd, J. R., 100: 137
Lobb, A. W., 98: 265; 100: 358
Lochman, D. J., 98: 847
Loe, R. H., 96: 438; 98: 160
Loehrer, D. C., 100: 384
Loewy, A., 98: 844
Lombardo, C. R., 100: 666
Longmire, W. P., Jr., 96: 287
Loomis, J. W., 98: 223
Lord, G. H., 100: 439
Loré, J. M., Jr., 97: 324
Losee, F. L., 97: 721
Lotman, H. A., 96: 426
Luddecke, H. F., 96: 118, 453
Ludington, L. G., 96: 571; 100: 332
Lui, A. H. F., 96: 425
Lyday, J. E., 97: 346
Lymberopoulos, P., 98: 683
Lyon, C. G., 98: 283
Lyttle, S. N., 95: 507; 98: 530

Macfarlane, D. A., 99: 562
MacGregor, K. H., 96: 98

MacKay, C. R., 96: 708
Macksood, A. J., 100: 54
Macnab, I., 97: 543
Madding, G. F., 97: 326; 98: 276
Maeck, B. H., 99: 625
Maggs, R. L., 98: 111
Magovern, G. J., 99: 885
Mahoney, E. M., 100: 133
Mahoney, J. W., 95: 577
Majnarich, G., 100: 740
Mandarino, M. P., 97: 442
Mangiardi, J. L., 97: 222
Manlapaz, J. S., 100: 723
Manlove, C. H., Jr., 97: 113; 99: 841
Mannix, H., Jr., 99: 449
Mansfield, R. D., 100: 462
Mansueto, M. D., 100: 835
Marcks, K. M., 95: 932
Margolius, B. R., 95: 787
Margulies, G. S., 99: 339
Marino, H., 95: 267
Markarian, M., 97: 346
Markgraf, W. H., 95: 998
Markowitz, A., 96: 755
Markowitz, A. M., 97: 766
Marmor, L., 97: 236; 100: 124
Marshall, J. F., 95: 845
Martin, D. S., 97: 685
Martin, J. G., 100: 103
Martin, J. W., 96: 302; 99: 782
Marx, H. E., 96: 711
Mason, J. B., 99: 745
Mason, J. T., 96: 319
Massion, W. H., 96: 43
Masson, J. K., 100: 747
Masters, F. W., 98: 887; 99: 809
Mastrangelo, M., 99: 361
Mathewson, C., 100: 258
Mathewson, C., Jr., 100: 158
Mauer, I. S., 96: 708
Maurer, J. J., 97: 104
May, A. M., 100: 126
Mayer, J., 98: 343
Mayfield, F. H., 98: 577
Mazur, M., 98: 628
McAllister, A. J., 97: 173
McArthur, J. D., 95: 617
McCartney, E. T., 96: 588
McCarty, R. T., 95: 144
McCorkle, H. J., 96: 172; 98: 290
McCown, I. A., 98: 509
McDonald, J., 99: 617
MacDonald, J. L., 98: 243
McFaddin, J. G., 95: 752
McGinnis, G. O., 95: 154
McGonigle, J., 100: 124
McGregor, J. K., 99: 97, 348
McGregor, M. W., 95: 227
McIndoe, A., 95: 197
McKain, J. M., 98: 756
McKenzie, A. D., 100: 176
McLaughlin, C. W., Jr., 99: 45
McLaughlin, H. L., 97: 679; 98: 539; 99: 628
McLeay, J. F., 96: 415
McLenathen, C. W., 98: 165
McLeod, G. H., 97: 494
McNall, E. G., 98: 217
McPhail, J. L., 99: 433
McPherson, R. C., 95: 359; 97: 713
Meade, J. W., 100: 120
Mechling, R. S., 99: 316
Meckstroth, C. V., 98: 126
Medl, W. T., 97: 447
Meek, C. P., 96: 557
Meek, J. R., 97: 104
Meese, E., 99: 891
Meftah, M., 98: 728
Meherin, J. M., 99: 636
Mehn, W. H., 97: 260
Mehnert, J. H., 98: 743
Meine, E. L., Jr., 96: 110
Melrose, D., 96: 221
Merendino, K. A., 98: 657; 99: 833; 100: 375
Mersheimer, W. L., 97: 191
Method, H. L., 97: 260
Meyer, A. C., 98: 653
Meyer, B. W., 100: 332
Meyer, S. W., 99: 924
Meyer, T. L., Jr., 99: 118, 251
Mieszczanski, A. W., 100: 431
Mikkelsen, W. P., 96: 183
Millard, D. R., Jr., 95: 318
Miller, D. R., 99: 420
Miller, G. F., 97: 151; 99: 179
Miller, J. A., 95: 752
Miller, J. M., 95: 967; 96: 689; 97: 321; 99: 48
Miller, J. W., 96: 618
Milloy, F., Jr., 96: 3
Mills, J. T., 95: 189
Milwidsky, H., 96: 670
Mitchell, J. H., 98: 805
Mitchell, J. R., 99: 228
Mixter, G., Jr., 97: 789
Mizeres, N. J., 95: 976; 97: 782
Mock, C. J., 98: 44
Modny, M. T., 99: 13
Moncrief, J. A., 96: 535
Moore, G. E., 97: 307
Moore, J. O., 97: 522
Moore, J. R., 97: 344
Moore, S. W., 97: 184
Moorhead, J. J., 95: 108
Morales, H., 100: 764
Moran, J. M., 98: 584
Moran, W. H., 99: 503
Moretti, G., 99: 301
Morgenstern, L., 98: 628
Mori, V., 97: 98
Moritz, J. R., 98: 493
Morrell, R. M., 99: 63
Morris, G. C., Jr., 99: 641, 775
Morris, L., 96: 387
Morse, H. N., 96: 472, 611, 732, 857; 97: 124, 244, 372, 798; 99: 108, 255, 380, 968; 100: 143, 498, 651, 787
Morton, T. V., Jr., 97: 75
Moseley, H. F., 98: 401
Moses, R., 97: 120
Moskovitz, W. S., 100: 110
Moss, H. C., 97: 307
Moss, W. T., 98: 912
Mowlem, R., 95: 216
Mueller, E. C., 97: 201
Mulholland, J. H., 95: 577
Muller, W. H., Jr., 96: 102; 98: 651; 99: 6; 100: 572
Murphey, F., 98: 379
Murphy, A. L., 97: 518
Murphy, G. P., 100: 666
Murphy, R. T., 100: 764
Murray, G., 99: 334, 918; 100: 676
Murray, J. E., 100: 486
Musselman, M. M., 99: 404
Myers, R. N., 99: 926; 100: 744
Myint, S. M. K., 99: 762

Nadal, J. W., 98: 190
Nagel, G. W., 99: 318
Najarian, J. S., 96: 172; 98: 290
Necheles, H., 99: 57
Neer, C. S., II, 95: 593; 99: 756
Neilson, R. O., 100: 206
Nelson, B., Jr., 100: 258
Nelson, H. M., 95: 659
Nelson, S. W., 96: 465, 600, 726, 860; 97: 126, 246, 374, 800; 98: 122, 642, 764, 768; 99: 110, 114, 260, 382, 970; 100: 148, 500, 656, 798
Nettrour, W. S., 97: 624
Nichol, W. W., 99: 908
Niebel, J. D., 97: 117
Nielsen, A., 99: 702
Nissan, S., 100: 59
Nobel, W., 100: 635
Nohlgren, J. E., 98: 223
Nordstrom, N., Jr., 98: 784
North, R. L., 97: 336
Novack, R. L., 99: 646
Novack, T. D., 97: 336
Nyhus, L. M., 96: 438; 98: 657; 100: 234, 544

Obenour, S. W., Jr., 96: 716
O'Brien, G., 96: 396
Ochsner, A., 96: 562
Ochsner, S. F., 96: 562; 99: 336
O'Connell, T. F., 98: 257
O'Connor, G. B., 95: 227
O'Conor, V. J., 99: 573
O'Dell, F. C., Jr., 96: 684
O'Donoghue, D. H., 98: 463
Oeconomopoulos, C. T., 100: 457
Ogawa, T., 97: 744; 99: 57
O'Grady, M. J., 96: 584
Okinaka, A. J., 97: 499
Olivares, J., 98: 695
Oliveros, M., 96: 590
Olson, H. H., 98: 196
Olson, K. C., 100: 597
Omura, R. S., 99: 316
Orban, B. J., 98: 809
Orloff, T. L., 95: 469
Orten, A. U., 99: 676
Osborn, J. J., 100: 338
Osborne, M. P., 100: 48
Owens, N., 95: 167
Owsley, J. Q., 98: 290

Pace, W. G., 99: 827; 100: 590
Palmer, E. D., 99: 906
Palmer, T. E., 99: 144
Palumbo, L. T., 96: 511; 98: 702
Panagopoulos, A. P., 96: 840; 98: 898; 100: 835
Papadimitriou, D. G., 95: 132
Parente, J. T., 99: 343
Parker, M. L., 100: 661
Parrish, R. A., 97: 787
Passaro, E., Jr., 99: 827
Patten, J. C., 95: 772
Patterson, H. A., 98: 12
Pattison, A. C., 96: 183
Patton, J. F., 99: 525
Patton, R., 98: 447; 99: 633
Patton, T. B., 99: 651
Payne, M. J., 95: 932
Pearce, A. E., 99: 866
Pearce, C., 99: 292
Pearce, J. M., 97: 36; 100: 561
Pearson, O. H., 99: 544
Peartree, P., 96: 568
Peck, D. W., 97: 672
Peer, L. A., 95: 239
Peltier, L. F., 97: 311; 99: 821
Pelzer, R. H., 96: 735
Penn, J., 95: 255
Persky, L., 97: 558
Perutsea, S. C., 97: 283
Pester, G. H., 96: 568
Peterson, C. G., 96: 158
Pevehouse, B. C., 100: 633
Pfeffer, R. B., 97: 789
Phillips, J. W., 100: 384
Phillips, R. B., 95: 411
Pichel, R., 100: 753
Pickrell, K., 95: 246
Pierandozzi, J. S., 100: 245
Pierce, G. W., 95: 194
Pileggi, V. J., 97: 205
Pinck, R. L., 100: 753
Pine, D. K., 95: 518
Pitanguy, I., 95: 331
Pitt, L. P., 100: 737
Pitts, H. H., 98: 184
Polley, V. B., 97: 354
Porcaro, F., 100: 113
Porter, J. W., 99: 404
Porter, R. W., 100: 354
Posch, J. L., 95: 545; 97: 471
Postle, J. R., 97: 690
Powers, J. H., 99: 798
Pratt, G. H., 97: 696; 100: 389
Price, W. G., 98: 753
Priestley, J. T., 99: 413
Prigot, A., 95: 963; 96: 545; 97: 49
Prothero, S. R., 99: 798
Pryor, T. H., 99: 762
Putong, P., 98: 907

Quattlebaum, F. W., 97: 113; 99: 941
Querze, R. H., 96: 820
Quigley, L. F., Jr., 96: 820
Quigley, T. B., 97: 488; 98: 315, 477
Quinn, J. W., 99: 253, 966

Raaf, J., 97: 388
Rachun, A., 98: 363
Ragnell, A., 95: 323
Raitano, H. E., 95: 873
Raker, J. W., 95: 353
Randall, H. T., 99: 553
Rankow, R. M., 97: 766
Ransdell, H. T., Jr., 99: 788
Rasi, H. B., 96: 751
Raszkowski, H. J., 97: 363
Rathauser, F., 97: 734
Rauch, R. F., 98: 637
Ravdin, I. S., 98: 583
Rawlinson, K., 98: 337
Rawson, C. W., 100: 91
Ray, B. S., 99: 544
Raycroft, J. F., 99: 361
Redler, I., 99: 730
Reese, J. W., 95: 102
Regan, J. F., 100: 224
Rehbock, D. J., 97: 363
Reid, L. C., 100: 825
Reinus, F. Z., 98: 111
ReMine, W. H., 99: 413
Reno, J. H., 96: 581; 98: 451
Resnik, H. L. P., 95: 946
Reynolds, B., 98: 713
Reynolds, C. L., Jr., 99: 50
Rhoades, J. E., 97: 346
Rhoads, W. D., 100: 384
Riberi, A., 99: 100
Richards, V., 96: 309, 353; 100: 158, 384
Ricketson, G., 95: 279
Riordan, F. H., III, 97: 117
Ripstein, C. B., 96: 90; 99: 152
Risbeck, E. R., 99: 929
Ritchie, J. L., 100: 384
Ritter, S. A., 95: 87
Riveros, M., 96: 640
Rivlin, R. S., 100: 639
Robb, H. J., 95: 659
Roberts, B., 99: 762
Roberts, J. M., 98: 223
Roberts, M., 98: 713
Robertson, J. A., 96: 448
Robinson, D. W., 98: 887; 99: 809
Robinson, J. R., 95: 25
Robinson, M., 98: 894; 100: 845
Rochlin, D. B., 96: 372
Rockey, E. E., 96: 552
Roe, B. B., 96: 246
Roeder, C. A., 100: 589
Roesch, C. B., 99: 90
Roettig, L. C., 97: 63
Rogers, F. A., 96: 38, 379; 99: 268
Roll, W. A., 95: 138
Rolón, P. A., 96: 640
Romanoff, H., 96: 670
Rominger, C. J., 97: 698
Ronchese, F., 99: 301
Roof, W. R., 99: 641, 775
Roopenian, A., 96: 802
Root, G. T., 98: 243
Rose, R. S., 100: 643
Rosen, S., 95: 1011
Rosenberg, I., 95: 1011
Rosenblatt, M. S., 96: 343
Rosenhaus, H., 97: 211
Rosenman, L. D., 100: 194
Rosenthal, A. H., 95: 487
Rosomoff, H. L., 97: 721; 98: 704
Ross, J. K., 100: 338
Ross, W. D., 98: 577
Rousselot, L. M., 95: 684; 97: 429; 98: 31, 685
Rubenstein, A. S., 98: 116
Rubenstone, A. I., 100: 661
Rubin, L. R., 96: 827; 98: 880; 100: 818
Rubin, R. J., 96: 434
Rudolph, I., 97: 211
Rudowski, W., 95: 40

Ruge, D., 98: 918
Rumer, G. F., 96: 420
Rusnack, T. J., 95: 74
Russell, J. A., 96: 820
Ryan, A. J., 98: 325

Sachar, L. A., 99: 928
Saiken, L., 97: 342
Saint, J. H., 95: 798
Sako, K., 97: 307
Sakson, J. A., 98: 693
Salem, M. H., 99: 956
Salvati, E. P., 100: 381
Salvatore, J. E., 97: 442
Salvia, G. A., 96: 576
Samellas, W., 99: 766
Sampey, J. R., 95: 970
Sampson, J. J., 98: 211
Sampson, L., 96: 387
Sanborn, E. B., 97: 663
Santomauro, A. P., 99: 891
Saporta, J. A., 100: 94
Saracco, T., 100: 396
Sarkisian, S. S., 99: 960
Saunders, J. B. DeC. M., 99: 23
Saydjari, M. S., 97: 211
Saypol, G. M., 95: 1004
Sbarbaro, J. L., Jr., 100: 751
Scanlon, E. F., 98: 851
Scarborough, R. A., 96: 331
Schanno, J. F., 95: 974
Scheiber, W., 99: 84
Schenk, W. G., Jr., 97: 660; 99: 782
Schiff, B. L., 99: 301
Schiff, C. A., 99: 921
Schilling, J. A., 96: 43, 430, 696; 98: 3; 99: 283
Schirle, J., 99: 676
Schlesinger, E. B., 95: 641; 97: 466
Schlicke, C. P., 96: 27
Schlink, F. J., 95: 707
Schlitt, R. J., 100: 682
Schlussel, S., 97: 191
Schmidt, J. H., 95: 94
Schneewind, J. H., 97: 400; 98: 544
Schneider, K. M., 96: 90
Schnoor, E. E., 96: 107
Schnug, G. E., 96: 296
Schnute, W., 96: 624
Scholz, D. A., 99: 413
Schultz, L. R., 96: 618
Schultz, L. W., 96: 808; 98: 839, 921; 100: 869
Schwartz, A., 97: 777
Schwartz, A. H., 97: 137
Schwartz, S. I., 98: 20
Schwarz, A. W., 96: 784
Scott, H. W., Jr., 99: 70
Scott, J., 100: 38, 663
Scott, J. E. S., 99: 137
Scuderi, C., 95: 626
Secor, S. M., 96: 522
Segal, A. J., 99: 309
Segel, A. L., 98: 105
Segraves, J. E., 99: 814
Seipel, R. S., 100: 293
Seitzman, D. N., 99: 525
Sekiya, Y., 96: 663
Seligman, B., 95: 451
Selzer, J. D., 95: 144
Serlin, O., 99: 223; 100: 682
Sessions, R. T., 99: 70
Shabb, S., 97: 229
Shadish, W., 95: 194
Shaeffer, J. R., 98: 573
Shafiroff, B. G. P., 98: 34
Shaftan, G. W., 99: 657
Shamblin, J. L., Jr., 97: 92
Shann, H., 95: 425, 793; 96: 76; 98: 25
Shapiro, R. N., 96: 396
Shapiro, S. W., 96: 511
Sharma, K. D., 96: 506
Shearburn, E. W., 100: 744
Shelby, R. W., 96: 545
Shidler, F. P., 98: 152
Shidlovsky, B. A., 97: 49
Shieber, W., 100: 117
Shirokov, E. P., 100: 530
Shore, S., 95: 147
Shrivastav, J. B., 96: 506
Shulman, K., 98: 704
Sierp, M., 99: 766
Silbermann, E., 97: 191
Sills, A. H., 98: 787
Silvani, H. L., 96: 151
Silver, J. M., 97: 137
Simmons, J. C. H., 98: 379
Simon, M. M., 100: 85
Simpson, J. N. S., 97: 784
Simpson, R. L., 96: 675
Singmaster, L., 95: 1002
Sinkler, W. H., 98: 623
Sirak, H. D., 100: 455
Sites, E. C., 97: 316
Skoog, T., 95: 223
Slager, R. F., 99: 377, 964
Sloan, M. H., 97: 593
Sloan, R. F., 98: 217, 100: 864
Slocum, D. B., 98: 394
Smiley, D. P., 99: 27
Smith, A. E., 96: 792; 98: 830
Smith, A. M., 98: 606
Smith, B., 100: 140
Smith, D. J., 97: 17
Smith, D. R., 96: 254
Smith, E. P., Jr., 100: 623
Smith, F., 95: 173
Smith, F. G., 99: 332
Smith, G. K., 98: 236
Smith, G. V., 95: 336
Smith, L. L., 100: 262
Smith, M. C., 98: 753
Smith, S. E., 99: 713
Smith, S. S., 98: 653
Smithwick, R. H., 99: 192
Smythe, R. L., 95: 462
Sohier, W. D., 99: 538
Sokol, J. K., 99: 573
Sokolic, I. H., 99: 679
Sommers, S. C., 97: 79; 100: 606
Soranno, C. A., 100: 113
South, C., Jr., 97: 350
Sparger, C. F., 97: 354
Spickard, W. B., 98: 196
Stack, J. K., 97: 644; 98: 569
Stafford, C. E., 98: 271; 100: 245
Stahlgren, L. H., 96: 434, 515
Staley, C. J., 98: 851
Stallings, L., 99: 679
Stare, F. J., 98: 343
Stark, R. B., 97: 434
Stearns, D. B., 95: 862; 99: 244
Stearns, H. C., 96: 264
Steelquist, J. H., 98: 257
Steeper, J. R., 95: 883
Steffensen, W. H., 95: 237
Stehlin, J. S., Jr., 97: 756
Steiger, Z., 100: 8
Stein, H. L., 96: 445
Stein, J. J., 100: 808
Stemmer, A. L., 96: 802
Stenstrom, J. D., 96: 338
Stephanopoulos, K., 97: 360
Stephens, J. G., 97: 660
Stephenson, S. E., Jr., 97: 232
Stern, W. E., 100: 303
Stewart, I., 96: 588; 97: 784
Stewart, W. R. C., 99: 120; 100: 495
Stinchfield, F. E., 100: 12
Stone, C. S., Jr., 98: 133, 304
Stone, M. L., 97: 191
Stonesifer, G. L., Jr., 100: 666
Storey, C. F., 100: 71
Stout, A. P., 100: 740
Straub, L. R., 100: 751
Strauss, A. A., 97: 137
Strauss, S. F., 97: 137
Streete, B. G., 95; 45
Streli, R., 96: 701
Stuteville, O. H., 96: 787
Sullivan, C. R., 95: 636; 100: 698
Sullivan, J. J., Jr., 97: 222
Swanson, L. T., 96: 823
Sweeney, W. J., III, 100: 470
Sweetman, W. R., 98: 746

Swenson, O., 97: 734; 99: 134, 137; 100: 457
Swerdlow, H., 95: 818
Swerdlow, M., 98: 858
Swinton, N. W., 99: 144

Tabet, B. J., 100: 365
Takaro, T., 98: 617
Tannenbaum, C. S., 95: 897
Tannenbaum, J., 97: 137
Taveras, J. M., 95: 641
Taylor, L. E., 96: 545; 97: 49
Taylor, M., 97: 98
Taylor, P. H., 97: 63
Teitelman, S. L., 99: 247
Tenney, L. E., 97: 241
Terestman, N., 96: 646
Tetlow, F., 99: 358
Thatcher, D. S., 97: 383
Thiessen, N. W., 95: 163
Thomas, D. F., 99: 960
Thomas, G. I., 96: 438
Thomas, L. P., 99: 562
Thompson, L. R., 98: 625
Thompson, R. G., 96: 624
Thompson, S. A., 96: 552
Thorbjarnarson, B., 97: 36; 100: 561
Thorndike, A., 98: 316
Thoroughman, J. C., 99: 835
Thoshinsky, M. J., 95: 1007
Tolstedt, G. E., 100: 757
Traphagen, D. W., 99: 123
Treiman, R. L., 100: 171
Trevaskis, A. E., 95: 932
Trewin, M. L., 98: 758
Trota, J., 98: 907
Tuohy, C. E. M., Jr., 98: 160
Turell, R., 99: 154
Tye, M. J., 99: 301
Tyler, L. T., 95: 668

Uhley, H. N., 98: 211
Ullery, J. C., 96: 360; 97: 690; 99: 519
Upjohn, H., 97: 749
Urist, M. R., 98: 423
Usher, F. C., 97: 629
Uson, A. C., 96: 590
Utzinger, W., 100: 158

Valadka, B., 100: 527
Van Gaasbeek, J. B., 96: 780
Vannix, R., 98: 271
Vansant, J. H., 100: 572
Vaughn, A. M., 97: 69
Vazirani, S. J., 98: 839, 869, 921
Vermooten, V., 98: 457
Vernon, S., 95: 988; 96: 351
Veveloyiannis, D. P., 100: 672
Vieta, J. O., 95: 772
Virabutr, S., 95: 455
Vosseler, A. J., 96: 448
Voris, H. C., 100: 434

Wade, P. A., 95: 599; 97: 499, 634; 98: 526; 99: 745
Wagner, C. L., 98: 265
Wagner, M., 100: 43
Walden, R. H., 96: 827, 846; 98: 880; 100: 818
Waleson, M., 95: 484
Walker, G., 97: 173
Walker, J. C., Jr., 95: 239
Walker, R. V., 100: 850
Wall, C. A., 95: 664
Wallach, S., 96: 787
Waller, J. I., 95: 138
Walske, B. R., 95: 480; 97: 241
Walzer, I., 99: 236
Ward, G. E., 95: 385
Ward, J. G., 99: 352
Warren, W. D., 96: 102; 99: 934
Watkins, G. L., 96: 693
Watman, R. N., 97: 238, 804
Watson, J. R., 96: 96
Waxman, B. D., 97: 31
Webb, J. A., 96: 430
Webster, F. S., 99: 27
Webster, G. V., 96: 445; 100: 372
Webster, J. E., 95: 545
Webster, R. C., 96: 820
Weinberg, J. A., 98: 165
Weinberg, M., 100: 8
Weiner, J. J., 96: 724
Weinberger, H. A., 95: 772
Weinstein, M., 98: 713
Weir, G. J., Jr., 98: 373
Weissman, F., 99: 676
Welborn, K., 96: 615
Welch, J. W., 99: 857
Wellington, J. S., 100: 183
Welner, A., 97: 777
Wels, P., 99: 891
Welton, T. S., 95: 1
Weitzman, J., 100: 346
Wenzke, F., 96: 718
Wesson, M. B., 97: 84
West, C. F., Jr., 96: 115
Westdahl, P. R., 96: 324
Wetzel, N., 98: 800
Wheatley, G. M., 95: 711
Wheelock, M. C., 98: 907
White, M. S., 97: 69
White, W. L., 99: 804
Whitman, N. L., 96: 287
Whyland, W. A., 99: 77
Wilhelm, M. C., 98: 606
Wilkinson, R. W., 95: 731
Williams, R. D., 95: 462; 96: 1, 469, 729; 97: 575; 98: 447
Williams, T. K., 95: 651
Wilman, V. L., 100: 779
Wilson, B. J., 99: 694
Wilson, J. C., Jr., 100: 313
Wilson, J. S., 100: 761
Wilson, P. D., Jr., 99: 745
Wilson, T. H., Jr., 97: 340
Winfield, J. M., 99: 690; 100: 480
Winokur, M., 96: 679
Winterscheid, L. C., 98: 649; 100: 375
Wise, B. L., 97: 205
Wise, R. A., 96: 54; 98: 746; 100: 323
Witkowski, L. J., 96: 110
Wittenstein, G. J., 99: 938
Wohl, G. T., 99: 223
Wolf, S., 96: 430
Wolfe, K., 97: 739
Wolfe, K. B., 97: 279
Wolfman, E. F., Jr., 98: 4
Wollenweber, E. J., 97: 769
Woodward, F. D., 98: 521
Woolf, R., 95: 246
Woolvin, S. C., 97: 336
Workman, C. E., 96: 660
Worthen, E. F., 95: 237
Woughter, H. W., 98: 550
Wright, G. L., 96: 94
Wylie, E. J., 96: 213; 100: 183
Wynn, S. K., 98: 811

Yap, E. T., 95: 849
Yoon, C., 100: 845
Yoon, I. L., 96: 118, 453; 97: 195
Youmans, R. D., 100: 613

Zayas, A. M., 96: 3
Zaydon, T. J., 97: 418
Zeier, F. G., 100: 12
Zeifer, H. D., 100: 693
Zeit, W., 100: 43
Zimmerman, K., 99: 316
Zimmermann, B., 99: 503
Zintel, H. A., 99: 929
Zollinger, R. M., 95: 359; 97: 575; 99: 424
Zollinger, R. W., 98: 728; 99: 94
Zone, R. A., 99: 525
Zuhdi, M. N., 96: 696

Three Year Subject Index

Volumes 95–100 January 1958–December 1960

Subject Index, Volumes 95–100*

(E) = Editorial (DC) = Diagnostic Corner (CAC) = Case Analysis Clinic

Abdomen
  acute problem of, in elderly male (CAC), 98: 637
  and thorax, athletic injuries to, 98: 447
  hernias of anterior wall of, 95: 87
  pilonidal disease of wall of, 95: 142
  synovial sarcoma in anterior wall of, 97: 120
  trauma to, 97: 575
  tumor of, caused by imperforate hymen, 95: 487
  uncontrolled cancer of, 96: 281
Abdominal
  and pelvic procedures, multiple, Monilia Albicans fungemia following, 100: 470
  and perineal resection of rectum for carcinoma, 100: 194
  aorta, aneurysms of, resection and grafting for, 97: 270
  aortic aneurysms, intact and ruptured, 100: 176
    grafts, failure and replacement of, 96: 202
  injuries, nonpenetrating, 100: 22
  wall, tissue defects of, repaired with plastic prosthesis, 97: 629
    traumatic hernia of, 97: 340
Aberrant subclavian artery, management of division of (CAC), 100: 137
Abortions, incomplete, 95: 938
Abscess
  in right groin and mucocele of appendix, 96: 716
  pericolic, and pseudodiverticulum of colonic mucosa with inflammation, 97: 246
  right subphrenic, secondary to perforated peptic ulcer (DC), 97: 800
  subdiaphragmatic, 95: 455
Accident prevention, symposium on, 95: 707–727
Accidents
  and sagacity (E), 98: 649
  motor vehicle, among Armed Forces personnel, 98: 573
Acinic cell adenocarcinoma of parotid gland, 100: 639
Acromial process, excision of, for dislocation of shoulder, 100: 91
Acromioclavicular joint, dislocations of, 98: 423
Adenocarcinoma
  acinic cell, of parotid gland, 100: 639
  of small intestine, 96: 54
  perforated, of appendix, 100: 630
Adenolyphoma, 95: 923
Adenoma
  bile duct, of liver, 96: 118
  gastric, clinicopathologic study of, 98: 223
  oxyphilic granular cell, of parotid, 97: 333
  renal, 95: 862
  villous, and electrolyte depletion (CAC), 98: 772
    of rectosigmoid, hyponatremia due to, 98: 99
Adenylic acid suppositories for subacute thrombophlebitis and varicose ulcers, 95: 434
Adhesions and mid-small bowel obstruction (DC), 97: 374
Adhesive tape, non-irritating, multipurpose, 100: 789
Adrenal
  glands, tumors of, 95: 353
  tumors, 95: 914
Adrenalectomy and ovariectomy for metastatic cancer of breast, 96: 492
Aerosol
  pancreatic dornase, in postoperative atelectasis, 100: 447
  spray, for open treatment of burns, 97: 211
    povidone-iodine, in surgey, 97: 49
Aged
  cholecystostomy in, 100: 544
  postoperative psychosis in, 100: 38
Ainhum (dactylolysis spontanea) review of the literature and report of a case, 100: 480
Air
  bubbles, elimination of, in bubble-type oxygenator, 96: 696
  expired, ventilator, 97: 407
Airway in surgery for goiter, preservation of, 100: 85
Alar cartilage defects, management of, 95: 331
Alcohol
  d-pantothenyl, for postoperative discomfort, 97: 75
  pantothenyl, for ileus, 97: 191
  70% vs. absolute, as homograft preservative, 97: 98
Aldosteronism, primary, 100: 158
Alloplastic repair of defects in chest wall, 96: 670
Alveolar cell carcinoma of lung, 97: 368
Ambulance
  speeding, 95: 507
  transportation of injured in, 98: 530
Ameloblastomas, new treatment of, 98: 839
American Association for Surgery of Trauma and its objectives (E), 97: 379

* Numbers followed by a colon indicate volumes; all other numbers represent folios.

American Medical Association committee on injury in sports, 98: 325
Amphotericin B for Monilia albicans fungemia following multiple pelvic and abdominal procedures, 100: 470
Amputation
in peripheral vascular disease, lower extremity, 100: 682
incision for, of index finger and its metacarpal, 97: 331
level of, in third finger, 97: 477
stumps, local treatment of, with activated whole pancreas, 96: 545
Syme, 95: 688
Amylase
determinations, value of, in obscure upper abdominal disorders, 96: 61
serum, rapid screening test for, 100: 5
Amyloidosis
of gastrointestinal tract simulating gastric carcinoma, 96: 713
secondary, in injuries to spinal cord, 95: 843
Anastomosis
congenital portacaval, with cirrhosis of liver, 95: 163
ileorectal, for ulcerative colitis, 96: 684
of gastrointestinal tract, clamp for, 98: 728
subclavian-pulmonary, for tetralogy of Fallot, 96: 234
Anatomy
of female genital tract, 95: 425, 793
of septal artery in dogs' hearts, 97: 279
surgical, and technic of parotidectomy, 95: 885
Anemia
and persistent occult blood in stool, diagnostic significance of, 96: 54
sickle cell, splenectomy for, 95: 150
Anesthesia
and use of light cooling, 96: 137
emotional reactions of surgical patients to, 96: 646
local, for inguinal herniorrhaphy, 100: 782
meperidine-levallorphan in, 95: 787
physiologic basis for cardiac arrest during, 100: 354
sensitivity to, in patient with myasthenia gravis, 96: 102
Aneurysm
abdominal aortic, 97: 270
intact and ruptured, 100: 176
acute dissecting aortic, 96: 102
atherosclerotic, impending rupture of, 97: 98
false, in femoral arterial homograft, 98: 753
ruptured, of splenic artery, 96: 18
traumatic, delayed postgastrectomy hemorrhage from, 96: 115
Angiography, intracranial, danger from thorotrast for, 95: 469
Angiolipoma, benign renal, 96: 590
Ankle
abduction-external rotation fractures of, 97: 488
fractures, and dislocations treated by open reduction, 98: 136
and ligament injuries, 98: 477
Anomalies
arterial, of aortic arch, 96: 228
congenital, discovered in neonatal period, 96: 396
Anorectum, anatomy of, 100: 666
Anorganic bone grafting, experiences with heterografts processed by ethylenediamine extraction, 100: 12
Anoscope, rotatable, lighted, for anorectal evaluation, 98: 730
Antibiotics, evaluation of suture materials treated with, 98: 695
Anticoagulant therapy, intestinal obstruction complicated by, 97: 787
Antrum and upper jaw, squamous cell carcinoma of, 100: 401
Anus
and rectum, fistulas of, 95: 818
basal cell carcinoma of, 95: 822, 1011
congenital malformations of, 96: 343
posterior triangular space of, 96: 530
Aorta
abdominal, aneurysms of, 97: 270
absence of arch of, 98: 265
acute dissecting aneurysm of, 96: 102
coarctation of (DC), 100: 656
terminal, thrombosis of, 95: 990
thoracic, fatal perforation of, by gastric ulcer, 95: 878
upper thoracic, experimental replacement of segments of, 98: 617
valve of, apparatus for determination of gradients across, 98: 9
Aortic
and arterial segments, use of teflon in replacement of, 100: 389
aneurysms, abdominal, intact and ruptured, 100: 176
arch, arterial anomalies of, 96: 228
grafts, abdominal, replacement of, 96: 202
Apoplexy, pancreatic, treated by partial pancreatectomy, 97: 789
Appendectomy
McBurney, intraperitoneal landmarks in, 96: 96
removal of peritoneal "mouse" during, 96: 588
Appendicitis
acute, 95: 849
analysis of downward trend of, 98: 702
and cecal carcinoma, 95: 998
benign cecal lesions associated with, 98: 598
due to gallstones, 100: 120
simulated by diverticulitis of cecum, 95: 1002
Appendix
epiploica, gangrenous, and peritoneal "mouse," 96: 588
mucocele of, presenting as recurring abscess in right groin, 96: 716
perforated adenocarcinoma of, 100: 630
tissue committee and small hospital, 96: 693
Argentaffine tumor of jejunum with perforation, 97: 784
Arm, postmastectomy lymphedematous, lymphangiosarcoma in, 96: 576

Arterial
and aortic segments, use of teflon in replacement of, 100: 389
blood pH, indication for measurement of, 100: 352
reconstruction by endarterectomy, 100: 165
occlusive disease, arterial grafting for, 95: 25
prostheses, 100: 690
Arteries
cerebral, clip for temporary occlusion of, 100: 587
renal hypertension caused by fibromuscular hyperplasia of, 100: 183
Arteriography, femoral, showing vascular changes in dogs, 97: 494
Arteriomesenteric duodenal compression, 100: 262
Arteriosclerosis obliterans
clinical, 95: 451
muscle blood flow in, 96: 193
Artery,
aberrant subclavian, division of (CAC), 100: 137
anomalies of, causing tracheal and esophageal constriction, 96: 228
axillary, injury to, following anterior dislocation of shoulder, 95: 524
hypogastric, bilateral ligation of, 98: 34
inferior mesenteric, acute occlusion of, 98: 271
major gastroduodenal, injury to, producing traumatic aneurysm, 96: 115
peripheral, experimental embolism in, 96: 663
popliteal, surgical approaches to, 96: 213
septal, anatomy of, in dogs' hearts, 97: 279
splenic, ruptured aneurysm of, 96: 18
subclavian-pulmonary, anastomosis of, for tetralogy of Fallot, 96: 234
surgery of, and regional heparinization, 96: 12
thoracoacromial, rupture of after dislocation of shoulder, 97: 782
Arthritis, degenerative, of lumbar intervertebral joints, 100: 313
Arthrodesis
mid-tarsal, with tibial key graft, 96: 81
triple, followed by osteomyelitis of os calcis, 96: 708
Arthroplasty, cartilage block, for correction of temporomandibular joint disturbances, 98: 787
Ascites
and hydrothorax with malignant ovarian tumor, 95: 480
chylous, and coincident bilateral chylothorax, 96: 438
Aspiration
biopsy in diagnosis of thyroid tumors, 95: 40
needle, of peritoneal cavity, 96: 718
Atelectasis
postoperative, pancreatic dornase aerosol in, 100: 447
rebreathing tube for, 98: 20
Athletes, posterior dislocation of elbow joint in, 96: 393
Athletic injuries
muscle function in, 98: 353
to abdomen and thorax, 98: 447
to elbow, forearm, wrist and hand, 98: 432
to face, 98: 390
to genitourinary tract, 98: 457
Athletic injuries
to head and neck, initial management of, 98: 379
to pelvis, hip and thigh, 98: 451
to shoulder, mechanics of, 98: 394
region, 98: 401
Athletics
and nutrition, 98: 343
and organized medicine, 98: 325
modern, place of trainer in, 98: 337
Atomic bomb exposure, original signs and symptoms in patients surviving five years after, 98: 12
Atonia, gastric, after vagotomy, 98: 612
Atresia congenital
of posterior choana, 96: 802
of sigmoid colon, 96: 580
Automobile accidents
neurological, neurosurgical and psychiatric considerations in prevention and treatment of, 98: 577
responsibility of medical profession to victims of, 98: 526
Automotive crash injuries to spinal and femoral linkages, 95: 908
Autotransplantation of spleen following traumatic rupture, 100: 693

Back pain, 100 cases of, 97: 383
Bacterial flora of the gastric stump, 100: 663
Basal cell carcinoma in children, 96: 445
Baseball players, elbow and shoulder lesions of, 98: 484
Bile duct
adenoma of liver, surgical importance of, 96: 118
common, and gallbladder, operations upon, 95: 845
carcinoma of, 96: 126
drainage of, 97: 137
injuries to, 96: 287
massive hemorrhage from, 100: 623
retained stones in, 97: 173
Biliary
surgery, symposium on, 97: 131–183
system, extraheptatic, tumors of, 97: 141
tract, immediate and delayed rupture of the extrahepatic, following blunt abdominal trauma, 100: 107
non-penetrating trauma to, 97: 113
surgery of, 97: 3
Billroth I gastric resection for chronic duodenal ulcer, 100: 251
Biopsy
aspiration, in diagnosis of thyroid tumors, 95: 40
prescalene lymph node, 96: 372
scalene node, 96: 511
with delayed radical mastectomy for carcinoma of breast, 98: 184
Bladder, neurofibroma of, 97: 108
Bleeding
acute varical, and emergency portacaval shunt, 96: 183
diverticula of colon, management of, 100: 217

Blood
flow, muscle, in arteriosclerosis obliterans, 96: 193
persistent occult, in stool, diagnostic significance of, 96: 54
pH, arterial, indications for measurement of, 100: 346
Bone
defects, plaster of paris to fill, 97: 311
ethylenediamine-treated, for cranial reconstruction, 97: 721
formation, heterotopic, and hernia following gastrectomy, 95: 154
fractured and diseased, use of polyurethane polymer in, 97: 442
cassette holder for use during reduction of, 95: 854
giant cell tumor of, 96: 479
graft anorganic, 100: 12
for dishface deformity, 95: 323
homogenous, in mandibular reconstruction, 96: 755
growth, stimulation of, 95: 125
involvement in maxillofacial cancer, 98: 898
long, necrosis of, from deep burns, with evidence of regeneration, 95: 679
replacement of shaft defect of, 95: 752
marrow embolism, fatal, following thoracotomy, 95: 94
plates, Kirschner wire fixation of, in craniotomies, 96: 701
Book reviews
A Practical Handbook of Midwifery and Gynaecology (Haultain and Kennedy), E. & S. Livingstone Ltd., 96: 131
A Review of the Ciba Foundation Colloquia on Endocrinology, vol. II (Wolstenholme and Millar), Little, Brown & Co., 97: 130
A Short Practice of Surgery (Bailey and Love), J. B. Lippincott Co., 99: 391
A Synopsis of Anesthesia (Lee), Williams & Wilkins Co., 100: 152
A Synopsis of Surgical Anatomy (McGregor), Williams & Wilkins Co., 99: 392
Aids to the Diagnosis and Treatment of Diseases of Children (Allen), Bailliere, Tindall & Cox, 97: 130
An Atlas of Normal Radiographic Anatomy (Mechan and Farrer-Meshan), W. B. Saunders Co., 100: 152
An Introduction to Chest Surgery (Flavell), Oxford University Press, 96: 474
An Introduction to Surgery (Patey), Year Book Publishers, 99: 129
Annals of the New York Academy of Sciences. Surgical Convalescence (St. Whitelock), New York Academy of Sciences, 99: 130
Arterial Embolism in the Limbs (Jacobs), Williams & Wilkins Co., 100: 660
Atomic Energy in Medicine (Halnan), Philosophical Library, 97: 811
Bronchopulmonary Diseases. Basic Aspects, Diagnosis and Treatment (Naclerio), Paul B. Hoeber, 95: 334
Book reviews
Callander's Surgical Anatomy (Anson and Maddock), W. B. Saunders Co., 99: 129
Chemistry and Biology of Mucopolysaccharides, Ciba Foundation Symposium (Wolstenholme and O'Connor), Little, Brown & Co., 96: 131
Ciba Foundation Symposium on Carcinogenesis: Mechanisms of Action. Edited by G. E. W. Wolstenholme. Little, Brown & Co., 100: 152
Cold Injury, Ground Type (Whayne and De Bakey), Dept. of the Army, 99: 129
Cortisone Therapy (Glyn), Philosophical Library, 96: 132
Diseases of the Esophagus (Terracol and Sweet), W. B. Saunders Co., 98: 938
Doctor Squibb (Blochman), Simon & Schuster, 99: 131
Emergency War Surgery, NATO Handbook. U. S. Government Printing Office, 97: 811
Endocrine Aspects of Breast Cancer (Currie), E. & S. Livingstone Ltd., 96: 475
Eye Surgery (Stallard), Williams & Wilkins Co., 99: 130
Functional Bracing of the Upper Extremieies (Anderson), Charles C Thomas, 99: 608
General Diagnosis and Therapy of Skin Diseases (Siemens), University of Chicago Press, 97: 810
Gynecologic Surgery and Urology (Ball), C. V. Mosby, 95: 882
Handbook of Physiology, Section 1. Neurophysiology, volume 1, Editor in chief, John Fields. William & Wilkins Co., 100: 660
Head Injuries. Mechanisms, Diagnosis and Management (Gurdjian and Webster), Little, Brown & Co., 99: 130
Ideals in Medicine (Edmunds), The Tyndale Press, 98: 132
Insulin Crystals. Chemical and Biological Studies on Insulin Crystals and Insulin Zinc Suspensions (Schichtkrull), Ejnar Munksgaard Publishers, 99: 391
Introduction to Urology (Hamm and Weinberg), University of State of N. Y., Downstate Medical Center, 99: 131
Lumbar Disc Lesions (Armstrong), Williams & Wilkins Co., 99: 264
Management of Complications in Eye Surgery (Fasanella), W. B. Saunders Co., 96: 474
Martius' Gynecological Operations. With Emphasis on Topographic Anatomy (McCall and Bolten), Little Brown & Co., 95: 334
Medical Electrical Equipment (Molloy), Philosophical Library, 97: 812
Memoirs of a G. P. (Marshall), Vantage Press, 97: 250
Neurological Basis of Behavior (Wolstenholme and O'Connor), Little, Brown & Co., 99: 264

Book reviews
Operative Surgery, vol. VI, Hand, Amputations, Plastic Surgery, Gynaecology and Obstetrics (Rob and Smith), Butterworth & Co., Ltd., 97: 250
Operative Surgery, vol. VI, Orthopedic Surgery (Rob), Butterworth & Co., Ltd., 98: 782
Operative Surgery, vol. VIII (Rob and Smith), Butterworth & Co., Ltd., 99: 390
Pathophysiology in Surgery (Hardy), Williams & Wilkins Co., 97: 812
Physical Diagnosis: The History and Examination of the Patient (Prior and Silbertstein), C. V. Mosby Co., 99: 131
Physical Methods in Physiology (Catton), Philosophical Library, 96: 476
Principles of Pathology (Hopps), Appleton-Century-Crofts, Inc., 99: 391
Roentgen Diagnosis of Abdominal Tumors in Children (Nice, Margulis and Rigler), Charles C Thomas, 96: 132
Surface and Radiological Anatomy for Students and General Practitioners (Hamilton and Simon), Williams & Wilkins, 99: 392
Surgery in Infancy and Childhood (White and Dennison), E. & S. Livingstone Ltd., 97: 811
Surgery in World War II. Ophthalmology and Otolaryngology. U. S. Government Printing Office, 96: 476
Surgery of the Chest (Johnson), Year Book Publishers, Inc., 98: 132
Surgery of the Ear (Shambaugh), W. B. Saunders Co., 100: 660
Surgery of the Head and Neck. A Handbook of Operative Surgery (Wise and Baker), Year Book Publishers, 99: 132
Symposium on Diseases and Surgery of the Lens (Haik and McFetridge), C. V. Mosby, 96: 132
Synopsis of Treatment of Anorectal Diseases (Ross), C. V. Mosby Co., 99: 390
Textbook of Gynecology (Brewer), Williams & Wilkins Co., 96: 734
The ABC of Acid-Base Chemistry (Davenport), University of Chicago Press, 96: 475
The Acute Abdomen (Requarth), The Year Book Publishers, 97: 810
The Atlas of Technics in Surgery (Madden), Appleton-Century-Crofts, Inc., 98: 782
The Chemical Dynamics of Bone Mineral (W. F. Newman and M. W. Newman), University of Chicago Press, 97: 250
The Diagnosis and Treatment of Infections (James), Charles C Thomas, 96: 474
The Early Diagnosis of the Acute Abdomen (Cope), 96: 734
The Essence of Surgery (Welch and Powers), W. B. Saunders Co., 97: 812
The Hand: Its Anatomy and Diseases (Byrne), Charles C Thomas, 99: 391
Book reviews
The Healing of Wounds (Williamson), McGraw-Hill Book Co., 96: 476
The Management of Abdominal Operations (Maingot), Macmillan Company, 95: 882
The Pathology and Management of Portal Hypertension (Walker), Edward Arnold Publishers Ltd., 99: 390
The Pharmacologic Principles of Medical Practice (Krantz and Carr), Williams & Wilkins Co., 96: 474
The Physiology and Pathology of the Cerebellum (Dow and Moruzzi), University of Minnesota Press, 97: 810
The Roosevelt Hospital 1871–1957. Committee on History of Roosevelt Hospital, 98: 132
The Truth about Your Eyes (Vail), Farrar, Straus & Cudahy, 100: 660
The Year Book of Cancer, 1956–1957 Series (Clark and Cumley), The Year Book Publishers, 96: 859
The Year Book of Cancer, 1957–1958 (Clark), The Year Book Publishers, 99: 392
The Year Book of General Surgery (De Bakey), The Year Book Publishers, 97: 130
Tracheotomy: A Clinical and Experimental Study (Nelson), Williams & Wilkins Co., 98: 938
Transactions of the International Society of Plastic Surgeons. Williams & Wilkins Co., 96: 131
Transactions of the Pacific Coast Obstetrical and Gynecological Society, vol. 24, Western Journal of Surgery Publishing Co., 96: 475
Treatment of Cancer and Allied Diseases, vol. 1 (Pack and Ariel), Paul B. Hoeber, 99: 608
Tumors and Tumorous Conditions of the Bones and Joints (Jaffe), Lea & Febiger, 99: 392
Ulcerative Colitis (Bacon), J. B. Lippincott Co., 96: 734
Urologic Injuries in Gynecology. Including Vesicovaginal Fistula, Stress Incontinence and Ureteral Injuries (Falk), F. A. Davis Co., 95: 334
Water and Electrolyte Metabolism in Relation to Age and Sex (Wolstenholme and O'Connor), 99: 131
Bowel
management after hemorrhoidectomy, 95: 826
small, non-specific ulceration of, 96: 679
obstruction of, after partial gastrectomy, 96: 309
reticulum cell carcinoma of, 100: 602
spontaneous perforation of, in newborn, 100: 54
sterilization of, in infants and children, 98: 603
Boxing injuries, 98: 509
Brachial plexus
block, 95: 953
paralysis following administration of tetanus antitoxin, 95: 668
Brain
experimental injury to, and effect of hypothermia, 98: 704
regional hypothermia of, and its effect, 100: 43

Breast
cancer of, in female patients, 97: 31
in Rockford, Illinois, 98: 653
carcinoma of (E), 97: 1
and hamartomatous hypothalmic malformation, 100: 606
biopsy with delayed radical mastectomy for, 98: 184
diagnosis from frozen section in lesions of (E), 100: 661
granular cell myoblastoma of, 100: 98
malignant melanoma of, 97: 232
metastatic cancer of, 96: 492
Paget's disease of, in man, 98: 623
Bricker operation in urology, 96: 254
Bronchiogenic cyst, paraesophageal, 96: 107
Bronchus, suction of, 96: 552
Brooks, Dr. Barney, 98: 706
Bubble-type oxygenator, elimination of air bubbles in, 96: 696
Buccal mucosa, squamous cell carcinoma of, 100: 539
Burn
deep, and necrosis of skull and long bones, 95: 679
deformity of hand, management of (CAC), 100: 802
wound, microbial growth in, 95: 309
Burns
acute thermal, of face, 98: 923
chart for recording data in treatment of, 98: 693
chemical, 98: 928
electrical, of mouth, 98: 921
etiology and mortality, at a general hospital, 100: 381
local care of, 100: 68
of hand, 97: 421
open method treatment of, with aerosol spray, 97: 211
treated with activated whole pancreas, 96: 545
severe, control of infection in, 95: 684
third degree, of dorsum of hand, 96: 535
Bursa, infrapatellar, gas gangrene of, 97: 350

Café-au-lait spot, melanoma developing from a, 100: 129
Calculus, primary vesical, suggesting hyperparathyroidism, 97: 117
Cancer
abdominal, uncontrolled, 96: 281
deposition and retention of tetracycline in, 100: 384
detection with systemic tetracyclines and ultraviolet, 96: 415
intraoral, surgical management of, 98: 844
long delayed, of cervical stump, 97: 54
maxillofacial, bone involvement in, 98: 898
metastatic, of breast, 96: 482
of breast in Rockford, Illinois, 98: 653
survival of female patients with, 97: 31
of head and neck, 98: 915
office diagnosis of, 97: 300
treated with betatron electron beam, 98: 847
of ovary, 95: 336
Cancer
of rectum and colon, improvement of end results in, 96: 331
of testis, lymphadenectomy via transperitoneal approach for, 97: 756
of thyroid, a twenty-year follow-up of, 98: 190
oral, in women, 98: 869
quackery, 100: 808
surgery for, chemotherapy as adjuvant to (E), 97: 685
triple primary, 97: 241
uncontrolled abdominal or pelvic, second operations for, 96: 281
Carcinolytic effect of thio-TEPA on malignant melanoma, 95: 994
Carcinoma
alveolar cell, of lung, 97: 368
arising in minor salivary gland ducts of lower lip, 97: 79
basal cell, in children, 96: 445
of anus, 95: 822, 1011
cecal, and acute appendicitis, 95: 998
extensive, palliative subtotal esophagectomy for, 96: 38
following urinary diversion, 100: 133
gastric, occurring in a gastrostomy, 96: 430
simulated by amyloidosis of gastrointestinal tract, 96: 713
gastrointestinal, and eosinophils, 97: 195
in branchiogenic cyst, 96: 776
metastatic, and similarity of bile duct adenoma, 96: 118
of breast and hemartomatous hypothalamic malformation, 100: 606
biopsy with delayed radical mastectomy for, 98: 184
confusion in treatment of (E), 97: 1
of cervical stump, 96: 360
of colon and rectum in young people, 96: 47
of common bile duct, 96: 126
of duodenum, 95: 946
of hypopharynx, one-stage reconstruction for, 97: 217
of ileum in area of regional enteritis, 97: 336
of lung and application of scalene node biopsy, 96: 511
of palate, 100: 530
Carcinoma, of prostate causing rectal obstruction, 96: 319
of rectum, combined abdominal and perineal resection for, 100: 194
of small intestine, 96: 54
of thyroid, 95: 45
surgery for, 96: 272
papillary, of thyroid gland in children, 96: 27
persistent, 100: 620
primary, of gallbladder, 100: 365
renal, and solitary cyst of kidney, 95: 138
squamous cell, of anterior part of tongue, 98: 677
of buccal mucosa, 100: 539
of upper jaw and antrum, 100: 401
ulcerogenic non-beta cell pancreatic islet, 100: 48

Carcinosarcoma of uterus, 100: 522
Cardiac
arrest, clinical experience with, 96: 151
during anesthesia, physiologic basis for, 100: 354
output in dogs during cardiac massage, 100: 64
resuscitation, open versus closed chest, 97: 739
surgery, open, use of potassium arrest in, 96: 221
Cardiopulmonary bypass (E), 96: 477
Cardiorespiratory resuscitation (E), 95: 729
Cardiovascular disease, hypertensive, and intrarenal arteriovenous fistula, 96: 3
Carotid body and allied tumors, 95: 371
Carpal tunnel syndrome, 97: 466
Cartilage, alar, defects of, 95: 331
Case analysis clinics, 96: 469, 604, 729; 97: 804; 98: 126, 637, 772, 775; 99: 118, 120, 123, 251, 253, 374, 377, 964, 966; 100: 137, 140, 490, 495, 643, 646, 648, 802
Cassette holder
for operative cholangiography, 96: 426
for reduction of fractured bones, 95: 854
Catheters, bronchial suction, 96: 552
Causalgias, minor and major, 95: 545
Cecostomy and colostomy in acute obstruction of left colon, 96: 324
acute volvulus of, 95: 798
benign lesions of, associated with appendicitis, 98: 598
carcinoma of, and acute appendicitis, 95: 998
diverticulitis of, simulating appendicitis, 95: 1002
involved by strangulated partial enterocele, 95: 1004
perforation of, complicating adynamic ileus, 96: 718
spontaneous perforation of, 96: 448
subhepatic, complicated by volvulus of right colon, 97: 793
volvulus of, 96: 411; 98: 175
Central nervous system, fluid replacement and cerebral edema in management of surgical lesions of, 100: 303
Cerebral
arteries, clip for temporary occlusion of, 100: 587
edema and fluid replacement in management of surgical lesions of central nervous system, 100: 303
Cervical spine, hyperextension injury to, 96: 618
Cervix
carcinoma of stump of, 96: 360
long delayed cancer of stump of, 97: 54
Cesarean section
followed by overdistention and spontaneous rupture of cecum, 96: 448
management of placenta in, 98: 41
postmortem, 98: 758
Chemical burns, 98: 928
Chemodectoma, 100: 747
Chemotherapy
appraisal of, as adjuvant to cancer surgery (E), 97: 685
for granulocytic leukemia, 95: 970
Chest
closed, complications of trauma to, 97: 563
open versus closed, cardiac resuscitation, 97: 739
penetrating injuries to, 100: 709
severe nonpenetrating injuries to, 100: 715
wall, and repair with stainless steel wire mesh, wide block excision of desmoid tumors of, 100: 126
defects, alloplastic repair of, 96: 670
demand-flow respirator for large defect of, 97: 307
tissue defects of, repaired with plastic prosthesis, 97: 629
Children
and infants, Thiersch's operation for rectal prolapse in, 100: 457
mandibular condyloid process fracture in, 100: 835
polyps of the colon and rectum in, 100: 551
Chin and nose, plastic surgery of, 95: 231
Chlorophyllin
and inhibition of clotting, 95: 967
sodium-copper, causing inhibition of coagulase of Staph. aureus, 97: 321
Chlorpromazine jaundice (CAC), 100: 495
Choana, posterior, congenital atresia of, 96: 802
Cholangiography, operative
cassette holder for, 96: 426
simplified technic of, 96: 94
Cholecystectomy technic, 95: 988; 97: 151
Cholecystitis
acute, 96: 729; 97: 156
emphysematous, 96: 66
in a municipal charity hospital, 98: 283
emphysematous (DC), 97: 126
in children, 95: 1013
acute non-calculous, 100: 103
Cholecystostomy in the aged, 100: 544
Choledochocolic fistula, 95: 866
Cholestasis, intrahepatic, 97: 132
Chondromalacia of fabella, 98: 760
Chondrosarcoma in a phalanx, 100: 751
Chorionepithelioma of stomach, 100: 224
Chvostek sign, presence of, 96: 33
Chylothorax
coincident bilateral, and chylous ascites, 96: 438
postoperative, 100: 8
Cinefluorography in study of deglutition and phonation, 100: 864
Cirrhosis of liver and congenital portacaval anastomosis, 95: 163
Cleft lip, early closure of, 100: 869
Clitoris, double, 96: 596
Closure of cleft lip and palate, early, 100: 869
Clotting, inhibition of, by chlorophyllin, 95: 967
Coagulase, inhibition of Staph. aureus by sodium-copper chlorophyllin, 97: 321
Coarctation
absent aortic arch and other variants of, 98: 265
of aorta (DC), 100: 656
Colitis, ulcerative
ileorectal anastomosis for, 96: 684

Colitis, ulcerative
surgical treatment of, 98: 165
Colon
and rectum in children, polyps of, 100: 551
ascending, acute diverticulitis of, 100: 744
leiomyosarcoma of, 95: 1007
volvulus of, 98: 175
bleeding diverticuli of, 100: 217
cancer of, improvement of end results in, 96: 331
carcinoma of, in young people, 96: 47
diverticulosis of, 95: 813
endometriosis of, 100: 381
esophageal replacement of, 100: 71
hemorrhage of, 100: 600
left, acute obstruction of, 96: 324
right, intermittent volvulus of, 97: 316
volvulus of, complicating subhepatic cecum, 97: 793
segmental dilation of, 97: 734
sigmoid, congenital atresia of, 96: 580
surgery of diverticulitis of, 100: 206
submucous lipoma of, 95: 471
transverse, volvulus of, 96: 122
Coloproctectomy, single-stage, compared with other procedures for treating ulcerative colitis, 98: 165
Colostomy
and cecostomy in acute obstruction of left colon, 96: 324
case, norms and deviations, 96: 522
in congenital atresia of sigmoid colon, 96: 580
Coma, hepatic, in surgical patients, 96: 172
Commissurotomy, observations on mitral valvular, 100: 512
Common duct, indications for exploration of, 98: 606
Compression and fracture healing with special plate, 95: 761
Contracture, Dupuytren's surgery for, 95: 197
Contusion of left kidney (DC), 98: 764
Cooper, Sir Astley Paston, 97: 809
Cordotomy, dorsal, 96: 698
Cornea, tattooing of, 95: 246
Coronary heart disease, 95: 743
Court cases, surgery, 96: 472, 611, 732, 857; 97: 124, 244, 372, 798; 98: 120, 635, 762; 99: 108, 255, 380, 968; 100: 143, 498, 651, 789
Craniocerebral injuries
morbidity and mortality of, 96: 615
neurological evaluation of, 98: 918
Craniotomies, fixation of bone plates in, 96: 701
Cranium, reconstruction of, with ethylenediamine-treated bone, 97: 721
Cross-leg flap in traumatic surgery, 97: 434
Cryofibrinogen, pancreatic neoplasm and phlegmasia cerulea dolens, 97: 104
Curare anesthesia, sensitivity to, in patient with myasthenia gravis, 96: 102
Cushing's syndrome, surgical management of (CAC), 98: 775
Cutaneous and intestinal neurofibromatosis, 100: 761
Cyst
branchiogenic, carcinoma in, 96: 776
epidermoid, of the spleen, 100: 475
paraesophageal bronchiogenic, 96: 107
solitary, of kidney and renal carcinoma, 95: 138
Cystadenoma
lymphomatosum, papillary, 95: 923
papillary, of accessory salivary gland, 96: 749
Cystic duct
and gallbladder, congenital absence of, 96: 724
remnant, 98: 296
Cystogastrostomy, pancreatic, technic and merits of, 97: 718
Cysts
congenital splenic, 96: 302
dermoid and bilateral, of ovaries, 98: 739
intradiaphragmatic, removal of, 98: 95
paraesophageal ciliated, of mediastinum, 96: 420
pilonidal, primary closure of, with wire-button retention, 97: 328
primary retroperitoneal pseudomucinous, 98: 750

Dacron in blood vessels, study of, 95: 3, 16
Dactylolysis spontanea (ainhum), 100: 480
Dallas tornado disaster, 95: 501
Debricin ficus protease, indications for and application of, 98: 685
Débridement
enzymatic, with activated whole pancreas, 96: 545
with bovine fibrinolysin, 98: 4
with papain-urea-chlorophyllin ointment, 95: 828
use of Debricin ficus protease for, 98: 685
Decubitus ulcers, local treatment of, with activated whole pancreas, 96: 545
Deformity of a hand, burn (CAC), 100: 802
Degenerative disease simulated by lipoma of spinal cord, 96: 462
Deglutition, cinefluorographic studies of, 100: 864
Dermatome
Brown-Berger, for skin grafting, 95: 986
simple manual, 97: 90
Dermoid, ruptured intracranial, 100: 723
Desmoid tumors of the chest wall, 100: 126
DeWall-Lillehei oxygenator, elimination of air bubbles in, 96: 696
Dextran as plasma expander, 97: 593
Diagnosis
of cancer with systemic tetracyclines and ultraviolet, 96: 415
of cervical dislocation, 95: 636
of hepatic coma in surgical patients, 96: 172
of thyroid tumors, aspiration biopsy in, 95: 40
of tumors of testis, 95: 341
sigmoidoscopic, of regional enteritis, 95: 144
Diagnostic corner, 96: 465, 600, 726, 860; 97: 126, 374, 800; 98: 122, 642, 764; 99: 110, 114, 260, 384, 970; 100: 148, 500, 656, 798
Diaphragm, removal of cyst within, 98: 95

Diet for athletes, 98: 343
Diplopia
and eye muscle imbalance in orbital and zygomatic fractures, 96: 735
traumatic, 97: 518
Disc
protruded lumbar intervertebral, 97: 388
protrusions, lumbar, 100: 434
removal, intervertebral, and spine fusion, 96: 624
subtotal anterior lumbar, excision of, and vertebral body fusion, 97: 649
ruptured cervical, vertebral body fusion for, 98: 722
Disease, concomitant, and occurrence of trauma, 95: 897
Dishface deformity, bone grafts for, 95: 323
Dislocation
and fracture of ankle, open reduction of, 98: 136
anterior, of shoulder, and injury to axillary artery, 95: 524
cervical, diagnosis of, 95: 636
chronic, of shoulder, excision of acromial process for, 100: 91
forward, of carpal lunate bone (DC), 98: 642
fracture, key graft fixation in, 96: 81
of acromioclavicular joint, 98: 423
of shoulder, recurrent, 100: 423
repair of thoracoacromial artery rupture after, 97: 782
posterior, of elbow joint in athletes, 96: 393
voluntary bilateral posterior, of shoulder joint, 97: 777
Diverticuli, of colon, management of bleeding, 100: 217
Diverticulitis
of ascending colon, acute, 100: 744
of cecum simulating appendicitis, 95: 1002
of sigmoid colon, 100: 206
Diverticulosis of colon, massive hemorrhage from, 95: 813
Diverticulum
giant pharyngoesophageal, 97: 222
Meckel's, with obliterated omphalomesenteric duct, 97: 225
solitary jejunal, hemorrhage from, 100: 597
Dornase aerosol, pancreatic, in postoperative atelectasis, 100: 447
Dorsum of hand, third degree burns of, 96: 535
Doyen intestinal clamp, 95: 983
Drainage
of common bile duct in subacute and chronic jaundice, 97: 137
of pleural space, physiologic principles of, 96: 246
Drape, new transparent plastic surgical, 100: 590
Driver education program in Flint, Michigan, 98: 550
Ductless glands, symposium on surgery of, 95: 335–403
Ductus choledochus, surgical exploration of, 100: 94
Duodenal
and gastric ulcers, spontaneous perforations of, 97: 796
compression, arteriomesenteric, 100: 262
ulcer, perforated, in infant with survival, 97: 346
Duodenostomy in gastric resection for duodenal ulcer, 95: 781
Duodenum
carcinoma of, 95: 946
hematoma of, 95: 484
mobilization of, in gastrectomy, 98: 713
stenosis of, with omphalocele, 97: 229
traumatic intramural hematoma of, 96: 568
ulcer of, gastric resection for, 95: 781
surgery for in community hospitals, 96: 369
survey of elective operations for, 96: 365
Dupuytren's contracture,
radical fasciectomy for, 100: 372
surgery for, 95: 197
Dynamics, vascular, during hemorrhagic shock and therapy, 95: 659
Dysphagia and esophageal defect caused by ruptured anterior nucleus pulposus, 98: 631
Dystrophy, post-traumatic sympathetic, pathogenesis of, 97: 454

Ear
congenital deformities of, 95: 185
middle, reconstruction of, 100: 823
Ecchymosis, postoperative, 96: 751
Ectopic presacral kidney, 100: 148
Edema
cerebral, and fluid replacement in surgical lesions of central nervous system, 100: 303
lymphatic, surgery for, 95: 216
Editorials
Accidents and sagacity, 98: 649
Alternate metabolic pathways, 96: 351
American Association for Surgery of Trauma and its objectives, 97: 379
Appraisal of chemotherapy as adjuvant to surgery for cancer, 97: 685
Autogenous skin bank, 95: 883
Cardiopulmonary bypass, 96: 477
Cardiorespiratory resuscitation, 95: 729
Challenge of emergency clinics, 96: 1
Confusion in treatment of carcinoma of breast, 97: 1
Conservative treatment of fractures, 97: 253
Diagnosis from frozen section in lesions of the breast, 100: 661
Holes in rubber gloves, 100: 363
Intensive nursing care, 100: 1
Introduction to symposium on maxillofacial surgery, 98: 783
Introduction to symposium on medical aspects of traffic safety and related injuries, 98: 517
Introduction to symposium on sports injuries, 98: 315
Introduction to symposium on biliary surgery, 97: 131
Introduction to symposium on surgery of ductless glands, 95: 335
Nursing education and shortage of nurses (Presidential Address, Pacific Coast Surgical Association), 96: 133

Editorials
Palliative surgery for advanced malignancy, 100: 511
Problems in management of perforated peptic ulcer, 98: 1
Pulmonary hypertension and cardiac surgery, 98: 651
Recognition of hyperparathyroidism, 96: 613
Recovery room, 97: 251
Responsibility (Presidential Address, Pacific Coast Surgical Association), 98: 133
Robert M. Zollinger, M.D., Editor, 95: 1
Surgical technic, 98: 3
To Sir Harold Gillies, 95: 167
Trauma—twenty years and after, 95: 489
Utilization of medicomilitary history, 97: 687
Education
medical, in total war, 95: 493
nursing, and shortage of nurses, 96: 133
Elbow
and shoulder, lesions of, in baseball players, 98: 484
forearm, wrist and hand, athletic injuries to, 98: 432
joint, posterior dislocation of, in athletes, 96: 393
Electrolyte and fluid balance following injuries to head, 97: 205
Elephantiasis of lower extremity, 96: 84
Embolism,
fat, and a fat center, 100: 676
fatal bone marrow, following thoracotomy, 95: 94
pulmonary, 97: 274
peripheral arterial, 96: 663
Emergency
clinics, challenge of (E), 96: 1
room experience in community hospital, 97: 663
requirements for, 98: 544
service, need for active teaching program in, 97: 400
Emotions of surgical patients regarding hospitalization, anesthesia and surgery, 96: 646
Emphysematous cholecystitis, acute, 96: 66
Enchondroma of sternum, 96: 559
Endarterectomy, arterial reconstruction by, 100: 165
Endocrine
disease and gastroduodenal ulcers, 97: 17
tumors, peptic ulceration with, 100: 764
Endometriosis
enigma of, 100: 122
of colon, 100: 381
Enteritis, regional
carcinoma of ileum in area of, 97: 336
diagnosed by sigmoidoscopy, 95: 144
Enterocele, strangulated partial, involving cecum in femoral hernia, 95: 1004
Enterostomy, temporary, 96: 90
Enterotomy-colotomy decompressor for intestinal obstruction, 96: 428
Environment and congenital anomalies, 96: 396
Enzymatic débridement with papain-urea-chlorophyllin ointment, 95: 828
Enzymes, débridement of ulcerating wounds with, 98: 4
Eosinophil and gastrointestinal carcinoma, 97: 195
Epidermoid cyst of spleen, 100: 475
Esophageal
atresia of, and imperforate anus (CAC), 100: 140
replacement with right and transverse colon, 100: 71
resection and fatal perforation of thoracic aorta, 95: 878
Esophagectomy, palliative subtotal, for carcinoma, 96: 38
Esophagitis
and stricture caused by nasogastric tube, 98: 116
reflux, complicated by hemorrhage, 98: 657
Esophagopulmonary fistula, acquired benign, 96: 705
Esophagus
acute bleeding from, 97: 110
congenital segmental stenosis of, 97: 772
constriction of, due to arterial anomalies of aortic arch, 96: 228
lower, spontaneous perforation of, 96: 465
lye stricture of, 100: 71
replacement of, 100: 278
thoracic, restoration of, with aortic homograft, 96: 38
Ethylenediamine extraction and anorganic bone grafting, 100: 12
Ethylenediamine-treated bone, cranial reconstruction with, 97: 721
Eventration in newborn, conservative management of, 97: 769
Excision, multiple
and occasional Z-plasty for disabilities of exposed surfaces, 95: 173
limitations of, 95: 237
Extensor pollicis longus tendon, rupture of, after blunt trauma, 96: 434
Extracorporeal circulation with heat exchanging filming oxygenator, 100: 338
Extremity
amputations in peripheral vascular disease lower, 100: 682
lower, and chronic lymphedema, lymphangiosarcoma, 100: 617
Extremities, skin grafting of, 96: 550
Eye
injuries to, 98: 384
muscle imbalance and diplopia in orbital and zygomatic fractures, 96: 735

Fabella, chondromalacia of, 98: 760
Face
acute thermal burns of, 98: 923
double tubed pedicle graft for large defects of, 95: 194
injuries to, in sports, 98: 390
osteogenic sarcoma of bones of, 96: 496
psychological impact of deformities of, 96: 745
Fallot, tetralogy of, in older persons up to fifth decade, 96: 234
Fasciectomy for Dupuytren's contracture, 100: 372
Fat
embolism and a fat center, 100: 676
intravenous, as supportive therapy after severe injuries, 95: 651
Feeding, jejunogastrostomy for, 95: 157

Fellea vesica divisa (bilobed gallbladder), 96: 584
Femoral
  and spinal linkages, crash injuries to, 95: 908
  hernia, 95: 1004
Femur
  fractures of neck of, 95: 132
  intertrochanteric fracture of, 96: 660; 97: 634
  primary reticulum cell sarcoma of, 100: 753
  supracondylar fracture of, in aged persons, 97: 499
Fibrinolysin, bovine, enzymatic débridement with, 98: 4
Fibroids, uterine, sarcomas in, 100: 416
Fibromuscular hyperplasia of renal arteries and hypertension, 100: 183
Fibromyxochondrosarcoma of mandible, 96: 780
Fibrosarcoma of tongue, 96: 711
Finger
  index, incision for amputation of, 97: 331
  metastasis to phalanx of, 97: 236
  third, level of amputation in, 97: 477
Fistula
  acquired benign esophagopulmonary, closure of, 96: 705
  external pancreatic, 96: 689
  gastrojejunocolic, with islet cell tumors of pancreas, 96: 98
  internal, of nasopharynx, 96: 571
  intrarenal arteriovenous, with hypertensive cardiovascular disease, 96: 3
  of parotid, 96: 763
  partial pancreatic, after gastrectomy, 97: 260
  recurrent racheoesophageal, 100: 110
Fistulas
  about anus and rectum, fistulotomy and fistulectomy for, 95: 818
  choledochocolic, 95: 866
  external postoperative fecal, 95: 51
  renoduodenal, 95: 462
Flaps
  cross-leg, in traumatic surgery, 97: 434
  double retated pedicle, for closure of large nasal defects, 95: 299
  posterior pharyngeal, for repair of cleft palate, 95: 304
Fluid
  and electrolyte balance following injuries to head, 97: 205
  peritoneal, from strangulated intestinal obstruction, 96: 387
  replacement in surgical lesions of central nervous system, 100: 303
Fluorescence in malignant lesions of various types, 96: 415
Football equipment, protective, 98: 363
Forceps for repairs of tendons and nerves, 97: 87
Forearm, elbow, wrist and hand, athletic injuries to, 98: 432
Foreign bodies
  in maxillofacial surgery, 96: 840
  in stomach, 97: 342
  location and removal of, 95: 108
Fracture
  abduction-external rotation, of ankle, 97: 488
  acute intracapsular, Moore prosthetic replacement in, 95: 577
  Colles', gangrene following, 100: 124
  comminuted, of lower end of radius, 95: 74
    of os calcis and chronic osteomyelitis, 96: 708
  complex mandibular, 97: 283
  conservative treatment of (E), 97: 253
  dislocations, mandibular, 100: 850
    mid-tarsal, key graft fixation in, 96: 81
  healing and compression, 95: 761
  intertrochanteric, of femur, 96: 660; 97: 634
  mandibular condyloid process, in children, 100: 835
    immobilization of, 100: 845
    subcondylar, immobilization of, 100: 845
  metastatic, treated with internal fixation, 97: 484
  multiple, early care of, 97: 43
  occult, of smaller elements of cervical vertebrae, 97: 530
  of bone, use of polyurethane polymer in, 97: 442
  of facial bones and diplopia, 97: 518
  of hip, early management of, 97: 660
    mortality survey, 95: 581
    osteotomy for complications of, 97: 644
  of intercondylar eminence of tibia, 95: 593
  of leg, open vs. closed methods of treating, 95: 599
  of neck of femur in children, 95: 132
  of os calcis, 95: 555
  of rib, simple, 97: 569
  of shaft of tibia, 97: 543
  open, of tibial shaft, 95: 415
  orbital and zygomatic, diplopia and eye muscle imbalance in, 96: 735
  simultaneous leg, 95: 617
  supracondylar, of femur in aged persons, 97: 499
Fractures
  and dislocations of ankle, open reduction of, 98: 136
  and ligament injuries of ankle, 98: 477
  of tibial shaft, conservative treatment of, 98: 593
Frozen section in lesions of the breast, diagnosis from (E), 100: 661
Full-thickness skin grafts, pedal, repair of contractures of hand with, 100: 412
Fungemia, Monilia albicans, following pelvic and abdominal procedures, 100: 470

G-27202, evaluation of, for reducing inflammation, 98: 31
Gallbladder
  and common bile duct, operations upon, 95: 845
  appendicitis due to stones of, 100: 120
  bilobed (fellea visica divisa), 96: 584
  congenital absence of, 96: 723
  disease, acute, 97: 156
  effect of pancreatic secretions on, in absence of bile, 98: 290
  macroscopically nonpathologic, 98: 276
  perforation of, 100: 407

Gallbladder
primary carcinoma of, 100: 365
so-called papillomas of, 96: 296
Gallstone ileus
diagnosis of, 96: 726
recurrent, 96: 379
Gangrene
following compound Colles' fracture, 100: 124
gas, 97: 582
of infrapatellar bursa, 97: 350
Gas gangrene
clinical inferences from experimental data, 97: 582
of infrapatellar bursa, 97: 350
Gastrectomy
duodenal mobilization in, 98: 713
followed by heterotopic bone formation and hernia, 95: 154
unusual type of internal hernia, 96: 129
hemorrhage after, 95: 411
after, from ruptured traumatic aneurysm, 96: 115
partial, followed by stomal or small bowel obstruction, 96: 309
pancreatic fistula after, 97: 260
Gastric
adenomas, clinicopathologic study of, 98: 223
and duodenal ulcers, spontaneous perforations of, 97: 796
heterotopia, 100: 396
re-resection, 95: 869
resection for chronic duodenal ulcer, 100: 251
for duodenal ulcer, duodenostomy in, 95: 781
stump, bacterial flora of, 100: 663
surgery for ulcer and neoplasm, 95: 772
ulcer, intrathoracic perforation of, on greater curvature, 96: 562
perforating thoracic aorta, 95: 878
Gastritis, giant hypertrophic, 98: 584
Gastroduodenal ulcers, postmortem analysis of, 97: 17
Gastrointestinal
carcinoma and the eosinophil, 97: 195
hemorrhage in aged, 100: 258
tract, primary amyloidosis of, 96: 713
Gastroschisis, repair of, 96: 675
Gastrostomy
carcinoma occurring in, 96: 430
temporary, 96: 90
Genital tract, female, anatomy of, 95: 425, 793; 96: 76
Genitalia, female external, incomplete duplication of, 96: 596
Genitourinary tract, sports injuries to, 98: 457
Geriatric patients with head and neck problems, 100: 813
Giant cell tumor of bone, 96: 479
Gillies, Sir Harold, 95: 167, 255
Gloves, rubber, holes in (E), 100: 363
Goiter
in children, 96: 27
substernal and intrathoracic, preservation of the airway in surgery for, 100: 85
Graft
abdominal aortic, 96: 202
anorganic bone, experiences with heterografts processed by ethylenediamine extraction, 100: 12
bone, for dishface deformity, 95: 323
double tubed pedicle, for large facial defects, 95: 194
fixation, key, in mid-tarsal fracture dislocation, 96: 81
homogeneous bone, in manidbular reconstruction, 96: 755
nerve, with toe-to-thumb transplant, 95: 315
preparation of, in microdermagrafting, 96: 557
repair of contractures of the hand with pedal full-thickness skin, 100: 412
split-thickness, for third degree burns of dorsum of hand, 96: 535
tube, for repair of palatal defect, 95: 301
Grafting
arterial, for arterial occlusive disease, 95: 25
as treatment of aneurysm of abdominal aorta, 97: 270
of skin of extremities, device for, 96: 550
skin, with Brown-Berger dermatome, 95: 986
Granular cell myoblastoma of the breast, 100: 98
Groin
hernias of, 100: 462
recurring abscess in, and mucocele of appendix, 96: 716

Hallux varus, congenital, 95: 274
Hamartomatous hypothalmic malformation and carcinoma of breast, 100: 606
Hand
blunt trauma to soft tissues of, 96: 434
burn deformity of (CAC), 100: 802
burns of, 97: 421
deformities of, 95: 189
elbow, forearm and wrist, athletic injuries to, 98: 432
injuries to, from homemade rockets, 97: 471
repair of contractures of, with pedal full-thickness skin grafts, 100: 412
surgery, emergency, tray for, 95: 980
third degree burns of dorsum of, 96: 535
tumors of, 100: 293
Harelip, single, radical rotation, 95: 318
Head and neck
athletic injuries to, 98: 379
cancer of, 98: 915
treated with betatron electron beam, 98: 847
malignancies of, neurosurgery for control of pain in, 98: 800
malignant tumors of, 98: 858
problems in geriatric patients, 100: 813
surgery in hospitals with four-year residency training, 96: 24
Head
cancer of, office diagnosis of, 97: 300
injuries to, 96: 615
fluid and electrolyte balance after, 97: 205
swellings of, treated with trypsin, 96: 787

Headgear, protective, engineering research on, 98: 368
Heart
  disease, coronary, 95: 743
  perforating wound of two chambers of, with survival, 97: 344
  revascularization of, 100: 572
Hemangioendothelioma, infantile, of parotid gland, 96: 784
Hemangioma, of striated muscle, cavernous, 100: 593
Hemangiopericytoma, 96: 640
  of ligamentum teres of liver, 100: 740
Hematoma
  compression of mediastinum by, 98: 735
  of duodenum, surgically proved, 95: 484
  subcapsular encysted, of spleen (DC), 98: 768
  traumatic intramural, of duodenum, 96: 568
Hemobilia, 100: 623
Hemoperitoneum, in newborn, 100: 117
Hemorrhage
  and reflux esophagitis, 98: 657
  colonic, approach to, 100: 600
  delayed postgastrectomy, from ruptured traumatic aneurysm, 96: 115
  from esophageal varices, 96: 110
  from jejunal diverticulum, 100: 597
  from liver, 95: 106
  gastrointestinal, in aged, 100: 258
  in gastric lipoma, 96: 453
  in plastic and maxillofacial surgery, agents for lessening of, 96: 846
  massive, from common bile duct to T tube, 100: 623
    from diverticulosis of colon, 95: 813
    pulmonary (CAC), 100: 490
  postgastrectomy, 95: 411
Hemorrhagic shock, vascular dynamics during, 95: 659
Hemorrhoidectomy, management of bowel after, 95: 826
Hemorrhoids, internal, office ligation of, 96: 401
Hemostasis in retropubic prostatectomy, 100: 465
Hemostatic agent, surgical absorbable, 100: 439
Heparinization, intra-arterial, 96: 12
Hepatic coma in surgical patients, 96: 172
Hepatitis, with jaundice, 97: 137
Hepatobiliary disease, accuracy of liver function tests in, 97: 702
Hepatorenal syndrome, 100: 431
Heredity and congenital anomalies, 96: 396
Hernia
  and heterotopic bone formation following gastrectomy, 95: 154
  congenital internal, 97: 201
  femoral, 95: 1004
  hiatal (DC), 100: 798
    with carcinoma of transverse colon, 98: 758
    with gastric occlusion and intrathoracic perforation of gastric ulcer on greater curvature, 96: 562
  indirect inguinal, repaired with quilting stitch, 95: 976
Hernia
  inguinal, and hydrocele, bilateral herniotomy for, in infancy and childhood, 97: 255
  internal, following gastrectomy, 96: 129
  of anterior abdominal wall, stainless steel ring chain net for, 95: 87
  of groin, new treatment, of, 100: 462
    preperitoneal repair of, 100: 234
  sciatic, 95: 974
  spigelian, 109: 515
  traumatic, of abdominal wall, 97: 340
  umbilical, observations on imbrication for repair of, 98: 236
Herniorrhaphy
  in advanced age group, 97: 69
  inguinal, local anesthesia for, 100: 782
  simplified, in infants and young children, 96: 88
Herniotomy, bilateral, for inguinal hernia and hydrocele, 97: 255
Heterotopia, gastric, 100: 396
Hiatus hernia (DC), 100: 798
Hip
  fractures of, 95: 581
    complications of, osteotomy for, 97: 644
    early management of, 97: 660
  pelvis and thigh, athletic injuries to, 98: 451
Hirschsprung's disease with extensive aganglionic segments, 98: 248
"Hocker" valve used in tracheotomy tubes, 98: 733
Homograft
  abdominal aortic, rupture of, 98: 746
  aortic, as replacement for portion of thoracic esophagus, 96: 38
  experimental skin, 95: 267
  femoral arterial, false aneurysm in, 98: 753
  for replacement after resection of atherosclerotic aneurysm, 97: 98
  skin, from postmortem sources, 97: 418
Homohemotherapy and survival of experimental skin homografts, 95: 267
Homotransplants, mammalian, of skin, 98: 217
Hospitalization, emotional reactions of surgical patients to, 96: 646
Hydrocele and inguinal hernia, bilateral herniotomy for, in infancy and childhood, 97: 255
Hydrothorax and ascites with malignant ovarian tumor, 95: 480
Hymen, imperforate, as cause of "abdominal tumor," 95: 487
Hyperinsulinism and gastrojejunocolic fistula with islet cell tumors of pancreas, 96: 98
Hypernephroma, nephrectomy for, followed by disappearance of pulmonary metastases, 96: 703
Hyperparathyroidism
  and intrathyroid parathyroid gland, 100: 757
  primary, 95: 395
  recognition of (E), 96: 613
  suggested by primary vesical calculus, 97: 117

Hypertension
caused by fibromuscular hyperplasia of renal arteries, 100: 183
intrarenal arteriovenous fistula of traumatic origin, 96: 3
pulmonary, and cardiac surgery (E), 98: 651
Hypertrophy
congenital orthopedic aspects of, 96: 654
prostatic, and obstructive uropathy (CAC), 100: 643
Hypnosis, medical, in maxillofacial and plastic surgery, 98: 826
Hyponatremia due to villous adenoma of rectosigmoid, 98: 99
Hypopharynx, carcinoma of, 97: 217
Hypoplasia of right hepatic lobe, 98: 628
Hypospadias, repair of, 95: 279
Hypotension and hypothermia for intracranial surgery during pregnancy, 100: 633
Hypothalamic malformation and carcinoma of breast, 100: 606
Hypothermia
and hypotension for intracranial surgery during pregnancy, 100: 633
deep, for intracardiac surgery, 100: 332
effect of, on experimental injury to brain, 98: 704
elective, during extracorporeal circulation with heat exchanging filming oxygenator, 100: 338
in thoracic and thoracoabdominal surgery, 96: 137
regional, its effect on the brain, 100: 43
Hysterectomy
total, importance of, 96: 360
vs. subtotal, 97: 54
vaginal, simplified technic of, 98: 25

Ileocolic intussusception (DC), 100: 500
Ileorectal anastomosis for ulcerative colitis, 96: 684
Ileum, carcinoma of, in area of regional enteritis, 97: 336
Ileus
adynamic, complicated by perforation of cecum, 96: 718
gallstone, 96: 726
postpartum and postoperative, 97: 191
recurrent gallstone, 96: 379
Impartial medical testimony, 97: 672, 675
Impartial panel of medical examiners, 97: 680
Imperforate anus and esophageal atresia and (CAC), 100: 140
Implant reconstruction of orbit, 100: 818
Incision
for amputation of index finger and its metacarpal, 97: 331
muscle-splitting, for dorsal cordotomy, 96: 698
Incontinence, stress urinary, in female, 96: 264
Infants and children, Thiersch's operation for rectal prolapse in, 100: 457
Infection
in severely burned patient, 95: 684
local treatment of, with activated whole pancreas, 96: 545
Infection
of biliary duct with jaundice, 97: 137
simulated by metastasis to phalanx of finger, 97: 236
soft tissue, treated by streptomycin pantothenate, 95: 963
Inflammation, evaluation of new agent for reduction of, 98: 31
Inguinal
hernia, indirect, repaired with quilting stitch, 95: 976
herniorrhaphy, local anesthesia for, 100: 782
Injuries
acute, tetanus antitoxin in, 95: 664
and deaths, automobile, medical and civic responsibilities of physician in preventing, 98: 521
and litigation, unethical medical and legal practices in, 95: 695
anorectal birth, 95: 425
athletic, in adolescents, 98: 332
muscle function in, 98: 353
to abdomen and thorax, 98: 447
to elbow, forearm, wrist and hand, 98: 432
to genitourinary tract, 98: 457
to head and neck, 98: 379
to pelvis, hip and thigh, 98: 451
to shoulder region, 98: 401
automotive crash, to spinal and femoral linkages, 95: 908
birth, to perineum, 95: 793
craniocerebral, neurological evaluation of, 98: 918
facial, in sports, 98: 390
from boxing, 98: 509
ligament, and fractures of ankle, 98: 477
multiple, early care of, 97: 43
severe, intravenous fat as supportive therapy after, 95: 651
skiing, 98: 493
mechanisms involved in, 97: 667
sports, frequency and nature of, 98: 316
symposium on, 98: 315–516
to brain, experimental, effect of hypothermia on, 98: 704
to eye, 98: 384
to head, fluid and electrolyte balance after, 97: 205
to knee, 98: 463
to shoulder in sports, 98: 394
to spinal cord, secondary amyloidosis in, 95: 843
ureteral and renal, comparison of, 97: 558
Injury
hyperextension, to cervical spine, 96: 618
to common bile duct, primary treatment of, 96: 287
to hand from homemade rockets, 97: 471
to head, 96: 615
whiplash, fallacy of term, 97: 522
Interatrial defects, repair of, through right anterolateral thoracotomy, 100: 455
Intestinal
clamp, Doyen, 95: 983
decompression tubes, siliconizing, 100: 584
neurofibromatosis, 100: 761

Intestinal
obstruction and mucoviscidosis, 100: 113
polyposis with oral pigmentation, 95: 873
Intestine
obstruction of, as complication of anticoagulant therapy, 97: 787
due to Meckel's diverticulum and persistent band, 97: 225
enterotomy-colotomy decompressor for, 96: 428
small, adenocarcinoma of, 96: 54
nonspecific ulceration of, 96: 679
strangulated obstruction of, 96: 387
Intracardiac surgery, hypothermia in, 100: 332
Intracranial
dermoid, ruptured, 100: 723
surgery during pregnancy, 100: 633
Intussusception, ileocolic (DC), 100: 500
Ischemia, Volkmann's, impending, 100: 635
Islet cell tumors of pancreas with gastrojejunocolic fistula, 96: 98
Ivalon sponge in blood vessels, study of, 95: 3, 16

Jaundice
apparent obstructive, 96: 469
chlorpromazine (CAC), 100: 495
subacute and chronic, liver decompression in, 97: 137
Jaws
and facial bones, osteogenic sarcoma of, 96: 496
squamous cell carcinoma of, 100: 401
Jejunal diverticulum, solitary, hemorrhage from, 100: 597
Jejunogastrostomy for feeding, 95: 157
Jejunum
argentaffine tumor of, with perforation, 97: 784
proximal, traumatic rupture of, 100: 731
Joint Action Committee and accident prevention, 98: 583
Joints, lumbar intervertebral, degenerative arthritis of, 100: 313

Kidney
benign angiolipoma of, 96: 590
congenital unilateral cystic, 95: 856
ectopic presacral, 100: 148
horseshoe, 95: 990
injuries to, 97: 558
solitary cyst of, and renal carcinoma, 95: 138
Kirschner wire fixation of bone plates in craniotomies, 96: 701
Knee, injuries to, 98: 463

Laceration, through and through, of superior vena cava, 96: 458
Laparatomy wound, "standardized" in rat, microscopic variables in, 97: 749
Laryngoceles, coexisting internal and external, 96: 810
Larynx, trauma to, and its complications, 97: 513
Leg
casualties, mass, 95: 617
fractures of, open vs. closed methods of treating, 95: 599
Legal complications of vasectomy, 97: 84
Legal-medical liaison, 96: 841
Leiomyosarcoma
of ascending colon with multiple polyposis, 95: 1007
of rectum, 98: 105
of stomach, 95: 477
Lesions
of elbow and shoulder in baseball players, 98: 484
of odontoid, 95: 641
Osgood-Schlatter, 95: 731
vascular, effect of vitamin A, niacin and riboflavin on, 95: 483
Leukemia, granulocytic, chemotherapy of, 95: 970
Ligaments
injury to and fracture of ankle, 98: 477
torn, experimental investigation of repair of, 98: 373
Ligamentum teres of liver, hemangiopericytoma of, 100: 740
Ligation, office, of internal hemorrhoids, 96: 401
Lip
cleft, early closure of, 100: 869
management of, 95: 204
ectopic mixed salivary tumors of, 96: 506
lower, carcinoma arising in minor salivary gland ducts of, 97: 79
medical clefts of, 96: 815
mucocutaneous angle deformity and recessive upper, correction of, 97: 297
prevention of secondary deformities of, 95: 932
unilateral cleft, design for repair of, 95: 223
Lipoma
of spinal cord simulating degenerative disease, 96: 462
of stomach, 96: 453
submucous, of colon, 95: 471
Litigation, personal injury, 95: 695
Liver
bile duct adenoma of, 96: 118
bleeding from, causing hemoperitoneum in newborn, 100: 117
cirrhosis of, and congenital portacaval anastomosis, 95: 163
decompression by drainage of common bile duct in subacute and chronic jaundice, 97: 137
effect on, in rabbits from ligation of hepatic artery, 98: 44
excisional procedures on, 97: 148
function tests, value of, 97: 702
hemangiopericytoma of ligamentum teres of, 100: 740
hemorrhage from, 95: 106
hypoplasia of right hepatic lobe of, 98: 628
Lobectomy, hepatic, 97: 148
Lumbar
disc excision and vertebral body fusion, 97: 649
protrusions, operations for, 100: 434
intervertebral disc, protrusion of, 97: 388
intervertebral joints, degenerative arthritis of, 100: 313

Lung
alveolar cell carcinoma of, 97: 368
carcinoma of, and application of scalene node biopsy, 96: 511
Lye stricture of esophagus, 100: 71
Lymph
flow, measurement of, from right duct in dog, 98: 211
node biopsies, prescalene, 96: 372
Lymphadenectomy, transperitoneal approach to, for cancer of testis, 97: 756
Lymphangioma, mesenteric and retroperitoneal, 97: 363
Lymphangiosarcoma
in postmastectomy lymphedematous arm, 96: 576
of lower extremity and lymphedema, 100: 617
Lymphedema
chronic, and lymphangiosarcoma of lower extremity, 100, 617
long-standing, and lymphangiosarcoma, 96: 576

Malignancy
of head and neck, neurosurgery for control of pain in, 98: 800
palliative surgery for (E), 100: 511
Mandible
complex fracture of, 97: 283
condyloid process fracture in children, 100: 835
fibromyxochondrosarcoma of, 96: 780
osteogenic sarcoma of, 100: 613
osteroradionecrosis of, 98: 887
prognathism of, corrected by ostectomy of ramus, 98: 830
corrected by osteotomies of rami, 98: 894
reconstruction of, with homogenous bone grafts, 96: 755
subcondylar fractures, immobilization of, 100: 845
transected, Vitallium implant for, 96: 768
Mandibular
asymmetry, management of, 100: 825
condylar fracture dislocations, 100: 850
fracture dislocations, traumatic, effect of on growth, 100: 850
fractures, immobilization of, 100: 845
Mastectomy
delayed radical, with biopsy, for carcinoma of breast, 98: 184
lymphedematous arm after, 96: 576
Maxilla, necrotizing states of, 96: 848
Maxillary arch, early expansion of, in cleft palate, 96: 823
Maxillofacial
and plastic surgery, medical hypnosis in, 98: 826
cancer, bone involvement in, 98: 898
growth abnormalities and cleft palate, 96: 820
surgery, antihemorrhagic agents in, 96: 846
foreign bodies in, 96: 840
symposium on, 96: 735–856; 98: 783–937; 100: 805–873
trauma and frontal sinus, 98: 796
McBurney appendectomy, intraperitoneal landmarks in, 96: 96
Meckel's diverticulum with obliterated omphalomesenteric duct, 97: 225
Mediastinum
compression of, by hematoma, 98: 735
paraesophageal ciliated cysts of, 96: 420
Medical-legal
considerations, 98: 875
liaison, 96: 841
Medicomilitary history, utilization of (E), 97: 687
Meek-Wall microdermatome for microdermagrafting, 96: 557
Meigs' syndrome, 95: 480
Melanoma
developing from café-au-lait spot, 100: 129
malignant, of breast, 97: 232
thio-TEPA for, 95: 994
of eye, with cancer of nose and rectum, 97: 241
Melena, massive, surgery for, 96: 515
Meningioma, extracranial, presenting as a tumor of the neck, 100: 486
Meperidine-levallorphan in anesthesia, 95: 787
Mesenteric and retroperitoneal lymphangioma, 97: 363
vascular occlusion, 96: 565
Mesentery, acute occlusion of inferior artery of, 98: 271
Mesotheliomas, pleural, 97: 360
Metabolic pathways, alternate (E), 96: 351
Metacarpal of index finger, incision for amputation of, 97: 331
Metallic prostheses for replacement of shaft defects of long bones, 95: 752
Metals, surgical, standards for, 97: 415
Metastasis
pulmonary, spontaneous disappearance of, after nephrectomy for hypernephroma, 96: 703
to phalanx simulating infection in finger, 97: 236
Metastatic fractures, treatment of, with internal fixation, 97: 484
Mice, peritoneal, 96: 588
Microbial growth in burn wound, 95: 309
Microdermagrafting using Meek-Wall microdermatome, 96: 557
Miller-Abbott tube intubation, technic and indications for, 98: 160
Mineralocorticoid excess, syndrome of, 100: 158
Monilia albicans fungemia following pelvic and abdominal procedures, 100: 470
Monteggia fracture-dislocation (DC), 98: 122
Moore prosthesis for acute intracapsular fractures, 95: 577
Mortality from burns at a general hospital, 100: 375
Motor vehicle accidents in Armed Forces, 98: 573
Mouth, electrical burns of, 98: 921
Mucocele of appendix presenting as recurring abscess in right groin, 96: 716
Mucosa, buccal, disorders of, 98: 805

Mucous membrane, oral, etiology of lesions of, 98: 809
Mucoviscidosis complicated by intestinal obstruction, 100: 113
Muscle
  adenylic acid, preoperative use of, in phlebitis and ulcers, 97: 696
  blood flow in arteriosclerosis obliterans, 96: 193
  function in athletic injury, 98: 353
  splitting incision for dorsal cordotomy, 96: 698
  striated, cavernous hemangioma of, 100: 593
Musculoskeletal cripples, as drivers, and relation to traffic accidents, 98: 569
Myasthenia gravis
  following surgery for dissecting aortic aneurysm under nitrous oxide, pentothal-curare anesthesia, 96: 102
  present status of thymectomy in, 98: 196
Myelography in presumed degenerative spinal cord disease, 96: 462
Myoblastoma of the breast, granular cell, 100: 98

Nasopharynx, internal fistula of, 96: 571
Neck
  bilateral radical dissection of, 98: 851
  cancer of, office diagnosis of, 97: 300
  swellings of, treated with trypsin, 96: 787
  tumor of the, extracranial, meningioma presenting as a, 100: 486
Neck and head
  athletic injuries to, 98: 379
  cancer of, 98: 915
  malignancies of, neurosurgery for control of pain in, 98: 800
  malignant tumors of, 98: 858
  problems in geriatric patients, 100: 813
  surgery in hospitals with four year residency training, 96: 24
Necrosis
  of maxilla, 96: 848
  of skull and long bones from deep burns, with evidence of regeneration, 95: 679
Needle
  holder, modified, 96: 425
  metal-tipped plastic intravenous, 95: 853
Neonatal period, congenital anomalies discovered in, 96: 396
Neoplasms
  benign, of stomach, 100: 561
  gastric surgery for, 95: 772
  of salivary glands, pathologic features of, 98: 907
  regression of, by limitation of vascular supply, 96: 771
Nephrectomy for hypernephroma followed by disappearance of pulmonary metastases, 96: 703
Nerve graft with toe-to-thumb transplant, 95: 315
Nerves and tendons, forceps for repair of, 97: 87
Nervous system, central, fluid replacement and cerebral edema in surgical lesions of, 100: 303
Neurofibroma
  of bladder, 97: 108
  of rectum and von Recklinghausen's disease, 95: 474
Neurofibromatosis, cutaneous and intestinal, 100: 761
Neurosurgery for control of pain in malignancies of head and neck, 98: 800
Newborn
  hemoperitoneum in, 100: 117
  spontaneous perforation of bowel in, 100: 54
Niacin, effect of, on vascular lesions, 95: 438
Nitrous oxide-oxygen-thiopental anesthesia, 95: 787
Non-beta cell pancreatic islet carcinoma, ulcerogenic, 100: 48
Nose
  and chin, plastic surgery of, 95: 231
  deformities of tip of, 96: 808
  large defects of, closed with double rotated pedicle flaps, 95: 299
  partial reconstruction of, 98: 784
Nucleus pulposus, ruptured anterior, causing esophageal defect and dysphagia, 98: 631
Nurses, shortage of, 96: 133
Nursing care, intensive (E), 100: 1
Nutrition and athletics, 98: 343
Nylon in blood vessels, study of, 95: 3, 16

Obstruction
  intestinal, complicating mucoviscidosis, 100: 113
  malignant stomal, after subtotal gastric resection, 97: 326
  mid-small bowel, and adhesions (DC), 97: 374
Occlusion of cerebral arteries, clip for, 100: 587
Odontoid, lesions of, 95: 641
Omphalocele with duodenal stenosis, 97: 229
Omphalomesenteric duct, persistent obliterated, with Meckel's diverticulum, 97: 225
Orbit, implant reconstruction of, 100: 818
Orbital and zygomatic fractures, diplopia and eye muscle imbalance in, 96: 735
Orlon in blood vessels, study of, 95: 3, 16
Orthopedic aspects of congenital hypertrophy, 96: 654
Os calcis
  fractures of, 95: 555
  osteomyelitis of, following triple arthrodesis, 96: 708
Osgood-Schlatter lesion, 95: 731
Ostectomy of ramus to correct mandibular prognathism, 98: 830
Osteoarthritis of spine, 98: 683
Osteogenic sarcoma of jaws and facial bones, 96: 496
Osteomyelitis of os calcis following triple arthrodesis, 96: 708
Osteoradionecrosis of mandible, 98: 887
Osteotomy
  of ramus for correction of mandibular prognathism, 98: 894
  pelvic support, for fracture complications of hip, 97: 644

Our surgical heritage, 97: 807; 98: 128, 130, 646, 648, 779, 781; 99: 127, 128, 257, 259, 386, 388, 974, 976; 100: 145, 147, 505, 507, 653, 655, 797
Output, cardiac, during cardiac massage, 100: 64
Ovariectomy and adrenalectomy for metastatic cancer of breast, 96: 492
Ovaries, bilateral dermoid cysts of, 98: 739
Ovary
  malignant tumor of, with ascites and hydrothorax simulating Meigs' syndrome, 95: 480
  tumors of, 95: 336
Oxygenator
  bubble-type, elimination of air bubbles in, 96: 696
  for hypothermia during extracorporeal circulation, 100: 338
  in hypothermia for intracardiac surgery, 100: 332

Pacific Coast Surgical Association, papers of, 96: 133–350; 98: 133–314; 100: 153–362
Paget's disease of male breast, 98: 623
Pain
  absence or insignificance of, in severe pancreatitis, 96: 61
  in shoulder with reference to calcific tendinitis and frozen shoulder, 95: 527
  low back, 97: 383
  postoperative, reduction of with muscle-splitting incision, 96: 698
Palate
  carcinoma of the, 100: 530
  cleft, and maxillofacial growth abnormalities, 96: 820
    bone-flap method in surgery for, 98: 811
    early closure of, 100: 869
    early expansion of maxillary arch in, 96: 823
    management of, 95: 204
    repair of, 95: 304
    vomar flap technic for correction of, 98: 821
  defect of, 95: 301
Pancreas
  activated whole, for enzymatic débridement, 96: 545
  apoplexy of, treated by partial pancreatectomy, 97: 789
  external fistula of, 96: 689
  islet cell tumors of, 96: 98
  pseudocyst of, 95: 160; 100: 30
  ulcerogenic tumors of, 95: 359; 97: 92
Pancreatectomy, partial, for pancreatic apoplexy, 97: 789
Pancreatic
  cystogastrostomy, technic and merits of, 97: 718
  dornase aerosol in atelectasis, 100: 447
  fistula, 97: 260
  islet carcinoma, ulcerogenic, 100: 48
  neoplasm, cryofibrinogen and phlegmasia cerulea dolens, 97: 104
Pancreatitis
  acute, atypical symptom-sign complex of, 96: 61
    surgical care of, 96: 604
Pancreatitis
  chronic, surgical management of, 98: 304
d-Pantothenyl alcohol, effect of, upon postoperative discomfort, 97: 75
Pantothenyl alcohol for ileus, 97: 191
Papain-chlorophyll-urea ointment in surgery, 95: 102
Papain-urea-chlorophyllin ointment for enzymatic débridement, 95: 828
Papillomas, so-called, of gallbladder, 96: 296
Paralysis, brachial plexus, following administration of tetanus antitoxin, 95: 668
Paraplegia and hyperextension injury to cervical spine, 96: 618
Parathyroid glands
  and hyperparathyroidism, 100: 757
  tumors of, 95: 395
Parotid
  gland, acinic cell adenocarcinoma of, 100: 639
    bilateral mixed tumors of, 97: 698
    fistulas of, 96: 763
    infantile hemangioendothelioma of, 96: 784
    oxyphilic granular cell adenoma of, 97: 333
  tumors, 100: 805
    of deep lobe of, 100: 323
Parotidectomy, technic of, 95: 885
Pectus excavatum, 98: 664
Pedal full-thickness skin grafts for contractures of hand, 100: 412
Pelvic and abdominal procedures and Monilia albicans fungemia, 100: 470
Pelvis
  hip and thigh, athletic injuries to, 98: 451
  uncontrolled cancer of, 96: 281
Penicillin and streptomycin, influence of in rabbits after ligation of hepatic artery, 98: 44
Peptic ulcer
  and endocrine tumors, 100: 764
  and gastrojejunocolic fistula, 96: 98
  as surgical problem, 95: 404
  multiple simultaneous complications of, 97: 184
  observations on surgical treatment of, 97: 709
  perforated, and right subphrenic abscess (DC), 97: 800
  problems in management of (E), 98: 1
Perforation
  of duodenal ulcer in infant with survival, 97: 346
  of two chambers of heart with survival, 97: 344
  spontaneous, of bowel in the newborn, 100: 54
Pericostal steel wire retention sutures, post-thoracotomy rupture of, 96: 43
Perineal and abdominal resection, synchronous, of the rectum for carcinoma, 100: 194
Perineoplasty for lacerated perineum of long-standing, 96: 76
Perineum
  birth injuries to, 95: 793
  lacerated, of long-standing, surgery for, 96: 76
Peripheral vascular disease, lower extremity amputation in, 100: 682

Peritoneal
fluid from strangulated intestinal obstruction, 96: 387
"mice," 96: 588
Peritonitis, caused by surgical glove starch powder, treated with steroids, 98: 111
pH of arterial blood, indication for measurement of, 100: 352
Phalanx
chondrosarcoma in, 100: 751
metastasis to, simulating infection in finger, 97: 236
Pharyngeal flap
posterior, for repair of cleft palate, 95: 304
staphylorrhaphy and speech aid for avoidance of maxillofacial growth abnormalities in cleft palate, 96: 826
Pharyngoesophageal diverticulum, 97: 222
Philtrum and cutaneous upsweep surgical formation of, 95: 227
Phlebitis and ulcers, muscle adenylic acid as preoperative adjunct to surgery for, 97: 696
Phlegmasia cerulea dolens, 95: 429; 97: 104
Phonation, cinefluorographic studies of, 100: 864
Phosphorus, radioactive, uptake of, in gastric carcinoma, 96: 430
Phrenic nerves, studies on, and diaphragm of dog, 97: 744
Physical fitness for sports, 98: 328
Physicians and world's hidden crisis, 95: 211
Physick, Philip Syng, 97: 807
Physiologic basis of cardiac arrest during anesthesia, 100: 354
Pigmentation, oral, and intestinal polyposis, 95: 873
Pilonidal
cysts and/or sinuses, primary closure of, 97: 328
disease of abdominal wall, 95: 142
treated by excision and primary closure, 96: 405
Placenta, management of, in cesarean section, 98: 41
Plastic
and maxillofacial surgery, medical hypnosis in, 98: 826
surgery, antihemorrhagic agents in, 96: 846
Plasma
expander, status of dextran as, 97: 593
pasteurized human, 97: 597
Plaster of paris to fill large bone defects, 97: 311
Plastic surgery
contributions of, to other fields of surgery, 95: 180
future of, 95: 312
of nose and chin, 95: 231
reconstructive, for advanced rhinophyma, 96: 792
vaginal, 95: 425, 793; 96: 76
Plethysmographs, electronic segmental and digital, used in arterial surgery, 98: 257
Pleura, mesotheliomas of, 97: 360
Pleural space, drainage of, 96: 246
Pneumatosis cystoides intestinalis, 96: 860
Pneumocholecystitis (DC), 97: 126
Pneumothorax (CAC), 98: 126
Polyposis
intestinal, with oral pigmentation, 95: 873
multiple, and leiomyosarcoma of ascending colon, 95: 1007
Polyps of the colon and rectum in children, 100: 551
Polyurethane polymer, use of, in fractured and diseased bones, 97: 442
Portacaval shunt, emergency, 96: 183
Posterior triangular space, troublemaker of anus, 96: 530
Postoperative complications, 100: 358
Postpartum and postoperative ileus, 97: 191
Potassium arrest in open cardiac surgery, 96: 221
Povidone-iodine aerosol spray in surgery, 97: 49
Practitioner and prevention, 95: 711
Pregnancy
abdominal, at term, 98: 625
intracranial surgery during, 100: 633
Prescalene lymph node biopsies, 96: 372
Presidential address
American Association for Surgery of Trauma, 97: 379
Pacific Coast Surgical Association, 96: 133; 98: 133; 100: 153
Prevention, accident, symposium on, 95: 707–727
Prognathism
in edentulous patients, surgery for, 96: 833
mandibular, corrected by ostectomy of ramus, 98: 830
corrected by osteotomies of rami, 98: 894
surgery for, prevention of functional deformities in, 96: 827
Prolapse
complete rectal, 96: 338
rectal, Thiersch's operation for, 100: 457
Prostate, carcinoma of, causing rectal obstruction, 96: 319
Prostatectomy
retropubic, hemostatis in, 100: 465
vesicocapsular, 100: 672
Prostatic hypertrophy and obstructive uropathy (CAC), 100: 643
Prostheses
arterial, 100: 690
importance of porosity in, 100: 557
plastic, for tissue defects of chest and abdominal wall, 97: 629
vascular, synthetic materials as, 95: 3, 16
Pseudocyst
of pancreas, 95: 160; 100: 30
pancreatic, cystogastrostomy for drainage of, 97: 718
postpancreatic, in adolescence, 95: 147
Pseudodiverticulum of colonic mucosa with inflammation and pericolic abscess, 97: 246
Pseudomyxoma peritonaei, 98: 229
Psychiatry on a children's surgical service, 95: 64
Psychological impact of facial deformities, 96: 745
Psychosis, postoperative, in the aged, 100: 38
Pulmonary
disease and biopsy of prescalene lymph node, 96: 372
embolism, fatal, 97: 274

Pulmonary
hemorrhage, massive, 100: 49
lesions, possible malignant, scalene node biopsy in, 96: 511
metastases, spontaneous disappearance of, after nephrectomy for hypernephroma, 96: 703
resection and closure of benign esophagopulmonary fistula, 96: 705
sequestration, 95: 31
Pyloroplasty and vagotomy for acute perforated duodenal ulcer, 100: 245

Quadriceps tendon, ruptures of, 95: 626

Radiation therapy for treatment of tumors of salivary gland, 98: 912
Radius, comminuted fractures of lower end of, 95: 74
Ramus, ostectomy of, to correct mandibular prognathism, 98: 830
Recklinghausen's disease with urinary manifestations, 97: 108
Reconstruction
implant, of orbit, 100: 818
of middle ear, 100: 823
Record, let's look at the (E), 100: 4
Recovery room (E), 97: 251
Rectal prolapse in infants and children, Thiersch's operation for, 100: 457
Rectosigmoid, villous adenoma of, with hyponatremia, 98: 99
Rectum
and anus, fistulas of, 95: 818
and colon in children, polyps of, 100: 551
cancer of, improvement of end results in, 96: 331
carcinoid tumors of, 98: 243
carcinoma of, in young people, 96: 47
combined abdominal and perineal resection for carcinoma of, 100: 194
complete prolapse of, 96: 338
congenital malformations of, 96: 343
leiomyosarcoma of, 98: 105
neurofibroma of, and von Recklinghausen's disease, 95: 474
obstruction of, by carcinoma of prostate, 96: 319
Regeneration, evidence of, after necrosis of skull and long bones, 95: 679
Rehabilitation after colostomy, 96: 522
Renal
adenoma, 95: 862
arteries, fibromuscular hyperplasia of, 100: 183
carcinoma and solitary cyst of kidney, 95: 138
Renoduodenal fistula, 95: 462
Re-resection, gastric, 95: 869
Resection
esophageal, and fatal perforation of thoracic aorta, 95: 878
gastric, for duodenal ulcer, 95: 781
of aneurysm of abdominal aorta, 97: 270
Resection
of atherosclerotic aneurysm in poor-risk patient, 97: 98
of duplication of stomach, 96: 721
of intrathoracic trachea for tracheal tumor, 97: 354
pulmonary, and closure of benign esophagopulmonary fistula, 96: 705
subtotal gastric, followed by malignant stomal obstruction, 97: 326
Respirator, demand-flow, for large defect of chest wall, 97: 307
Resuscitation
cardiac, open versus closed chest, 97: 739
cardiorespiratory (E), 95: 729
Reticulum cell sarcoma
of small bowel, 100: 602
primary, of femur, 100: 753
Retractor, self retaining spermatic cord, 100: 589
Retroperitoneal and mesenteric lymphangioma, 97: 363
Retroperitoneum, primary pseudomucinous cyst of, 98: 750
Rhinophyma, advanced, plastic reconstructive surgery for, 96: 792
Rib fracture, simple—a simple injury?, 97: 569
Riboflavin, effect of, on vascular lesions, 95: 438
Rockets, homemade,
injuries to hand from, 97: 471
management of patient with abdominal injury from, 98: 91
Roux principle in internal drainage for postpancreatic pseudocyst, 95: 147
Rubber gloves, holes in (E), 100: 363
Rupture
extrahepatic biliary tract following trauma, 100: 107
of abdominal aortic homograft, 98: 746
of cervical discs, vertebral body fusion for, 98: 722
quadriceps tendon, 95: 626
thoracoacromial artery after anterior dislocation of shoulder, 97: 782
traumatic, of proximal jejunum, 100: 731

Sacrococcygeal teratoma, 95: 1015
Safety Council, National, its policies and program, 95: 715
Salivary gland
accessory, papillary cystadenoma of, 96: 749
ducts of lower lip, carcinoma arising in, 97: 79
major, tumors of, 98: 904
mixed tumors of, 96: 506
neoplasms of, 98: 907
tumors of, treated with radiation therapy, 98: 912
Sarcoidosis and biopsy of prescalene lymph node, 96: 372
Sarcoma
in uterine fibroids, 100: 416
of stomach, 97: 36
osteogenic, of jaws and facial bones, 96: 496
of mandible, 100: 613

Sarcoma
primary reticulum cell, of femur, 100: 753
reticulum cell, of small bowel, 100: 602
synovial, in anterior abdominal wall, 97: 120
Scalene node biopsy, clinical application of, 96: 511
Sciatic hernia, 95: 974
Senna, standardized, and wetting agent preparation for bowel after hemorrhoidectomy, 95: 826
Sepsis and shock, 96: 158
Septal artery, anatomy of, in dogs' hearts, 97: 279
Serum amylase, screening test for, 100: 5
Shock
hemorrhagic, vascular dynamics during, 95: 659
in sepsis, 96: 158
Shoulder
and elbow, lesions of, in baseball players, 98: 484
anterior dislocation of, followed by injury to axillary artery, 95: 524
dislocation, excision of acromial process for, 100: 91
repair of thoracoacromial artery rupture after, 97: 782
injuries to, in sports, 98: 394
joint, voluntary bilateral posterior dislocation of, 97: 777
painful and frozen, 95: 527
recurrent dislocation of, 100: 423
region, athletic injuries to, 98: 401
Sickle cell anemia, splenectomy for, 95: 150
Sigmoid colon
congenital atresia of, 96: 580
diverticulitis of, 100: 206
Sigmoidoscopy in diagnosis of regional enteritis, 95: 144
Siliconizing intestinal decompression tubes, 100: 584
Sinus
frontal, and maxillofacial trauma, 98: 796
pilonidal, primary closure of, with wire-button retention, 97: 328
Situs inversus totalis, 98: 107
Ski injuries, 98: 493
mechanisms involved in, 97: 667
Skin
avulsed pedicled, management of, 97: 447
bank, autogenous (E), 95: 883
diving, rules of behavior for, 98: 506
exchanges, full thickness, between parents and their children, 95: 239
grafting of extremities, device for, 96: 550
repair of contractures of hand with, 100: 412
with Brown-Berger dermatome, 95: 986
homografts, experimental, 95: 267
from postmortem sources, 97: 418
mammalian homotransplants of, 98: 217
replacement, contiguous, and rotation pedicle, 95: 294
suture marks, 96: 631
Skull, necrosis of, from deep burns, with evidence of regeneration, 95: 679
Sodium-copper chlorophyllin, inhibition of coagulase of Staph. aureus by, 97: 321
Speech aid and pharyngeal flap staphylorrhaphy for avoidance of maxillofacial growth abnormalities in cleft palate, 96: 820
Spermatic cord
retractor, self-retaining, 100: 589
torsion of (CAC), 100: 648
Spigelian hernia, 100: 515
Spinal
and femoral linkages, crash injuries to, 95: 908
cord, injuries to, 95: 843
lipoma of, simulating degenerative disease, 96: 462
Spine
cervical, hyperextension injury to, 96: 618
hypermobility of, in children, 95: 636
fusion and intervertebral disc removal, 96: 624
osteoarthritis of, 98: 683
Spleen
autotransplantation of, following rupture, 100: 693
congenital cysts of, 96: 302
epidermoid cyst of, 100: 475
Splenectomy for sickle cell anemia, 95: 150
Splint, onlay-inlay, for mandibular fractures, 100: 845
Spondylolysis
and trauma, 95: 466
traumatic, 100: 698
Sports
injuries, frequency and nature of, 98: 316
symposium on, 98: 315–516
physical fitness for, 98: 328
Squamous cell carcinoma
of buccal mucosa, 100: 539
of upper jaw and antrum, 100: 401
Stainless steel
internal fixation units, deficiencies of, 95: 518
ring chain net for hernia of anterior abdominal wall, 95: 87
Staphylococcal infections in a large general hospital, 100: 534
Staphylococcus aureus, inhibition of coagulase of, by sodium-copper chlorophyllin, 97: 321
Staphylorrhaphy, pharyngeal flap, and speech aid for avoidance of maxillofacial growth abnormalities in cleft palate, 96: 820
Stasis, local treatment of, with activated whole pancreas, 96: 545
Steel wire retention sutures, post-thoracotomy rupture of, 96: 43
Stenosis
congenital esophageal, pathologic studies after resection for, 97: 772
duodenal, with omphalocele, 97: 229
Sternotomy, median, with a transverse submammary skin incision, 100: 779
Sternum, enchondroma of, 96: 559
Steroids, treatment of peritonitis with, 98: 111
Stomach
benign neoplasms of, 100: 561
carcinoma of, simulated by amyloidosis of gastrointestinal tract, 96: 713

Stomach
chorionepithelioma of, 100: 224
duplication of, 96: 721; 100: 59
foreign bodies in, 97: 342
intact human, detection of carcinoma in, 96: 430
leiomyosarcoma of, 95: 477
lipomas of, 96: 453
occlusion of, with hiatal hernia and intrathoracic perforation of gastric ulcer on greater curvature, 96: 562
organoaxial volvulus of, 96: 600
sarcoma of, 97: 36
Stomal
obstruction, malignant, after subtotal gastric resection, 97: 326
or small bowel obstruction after partial gastrectomy, 96: 309
Stones, retained, in common duct, 97: 173
Streptomycin
and penicillin, influence of, in rabbits after ligation of hepatic artery, 98: 44
pantothenate for soft tissue infections, 95: 963
Striated muscle, cavernous hemangioma of, 100: 593
Subclavian artery, aberrant, division of (CAC), 100: 137
Submaxillary duct, penetration of, by broken thermometer bulb, 98: 743
Suction
catheters, bronchial, 96: 552
high flow-high vacuum, in drainage of pleural space, 96: 246
Suppositories, adenylic acid, for subacute thrombophlebitis and varicose ulcers, 95: 434
Supracondylar fracture of femur in aged persons, 97: 499
Surgery
and cardiac arrest, 96: 151
and the thymus, 95: 366
arterial, and use of electronic segmental and digital plethysmographs, 98: 257
biliary, symposium on, 97: 131–183
cardiac, and pulmonary hypertension (E), 98: 651
cholangiography during, 96: 94
using cassette holder, 96: 426
complicated by volvulus of cecum, 96: 411
complications after, in elderly patients, 97: 713
Surgery, court cases, 96: 472, 611, 732, 857; 97: 124, 244, 372, 798; 98: 120, 635, 762; 99: 108, 255, 380, 968; 100: 143, 498, 651, 789
determination of pressure gradients across aortic valve during, 98: 9
discomfort after, d-pantothenyl alcohol for, 97: 75
ecchymosis following, 96: 751
elective, for duodenal ulcer, 96: 365
emotional reactions of patients to, 96: 646
for bile duct adenoma of liver, 96: 118
for cancer, chemotherapy as adjuvant to (E), 97: 685
for carcinoma of thyroid, 96: 272
Surgery
for chronic pancreatitis, 98: 304
for cleft muscular velopharynx, 98: 816
palate, bone-flap method in, 98: 811
for congenital deformities of ears, 95: 185
for dissecting aortic aneurysm using nitrous oxide, pentothal-curare anesthesia, 96: 102
for duodenal ulcer in community hospitals, 96: 369
for Dupuytren's contracture, 95: 197
for edentulous prognathic patients, 96: 833
for elephantiasis of lower extremity, 96: 84
for formation of philtrum and cutaneous upsweep, 95: 227
for intradiaphragmatic cyst, 98: 95
for intraoral cancer, 98: 844
for lacerated perineum of long-standing, 96: 76
for massive melena, 96: 515
for peptic ulcer, 95: 404
for pilonidal disease, 96: 405
for prognathism, prevention of functional deformities in, 96: 827
for protruded lumbar intervertebral disc, 97: 388
gastric, for ulcer and neoplasm, 95: 772
ileus after, 97: 191
in rocket era, 98: 91
in treatment of lymphatic edema, 95: 216
maxillofacial and plastic, medical hypnosis in, 98: 826
foreign bodies in, 96: 840
symposium on, 96: 735–856; 98: 783–937; 100: 805–873
of biliary tract, current problems in, 97: 3
of ductless glands, symposium on, 95: 335–403
of gallbladder and common bile duct, 95: 845
of hand, emergency, tray for, 95: 980
of head and neck in hospitals with four year residency training, 96: 24
of popliteal artery, approaches for, 96: 213
of temporomandibular joint, 95: 263
open cardiac, use of potassium arrest in, 96: 221
papain-chlorophyll-urea ointment in, 95: 102
plastic and maxillofacial, antihemorrhagic agents in, 96: 846
and other fields of surgery, 95: 180
future of, 95: 312
of nose and chin, 95: 231
reconstructive, for advanced rhinophyma, 96: 792
preparation of skin for, 97: 49
proving hematoma of duodenum, 95: 484
second operations for uncontrolled abdominal or [redacted] pelvic cancer, 96: 281
technic of (E), 98: 3
thoracic and thoracoabdominal, hypothermia in, 96: 137
traumatic, cross-leg flap in, 97: 434
treatment of peptic ulcer with, 97: 709
vaginal plastic, 95: 425, 793
wounds from, routine culture of, 98: 152
Surgical
anatomy and technic of parotidectomy, 95: 885

Surgical
patients, hepatic coma in, 96: 172
wounds, new concepts in treatment of, 97: 429
Suture
for trauma, 95: 512
marks of skin, 96: 631
materials treated with antibiotics, evaluation of, 98: 695
pericostal steel wire retention, post-thoracotomy rupture of, 96: 43
Syme amputation, 95: 688
Symposia
on accident prevention, 95: 707–727
on biliary surgery, 97: 131–183
on impartial medical testimony plan, 97: 672–684
on maxillofacial surgery, 98: 783–937
on medical aspects of traffic safety and related injuries, 98: 517–583
on sports injuries, 98: 315–516
on surgery of ductless glands, 95: 335–403
Symptom-sign complex, atypical, of acute pancreatitis, 96: 61
Synovial sarcoma in anterior abdominal wall, 97: 120

T tube causing massive hemorrhage from common bile duct, 100: 623
Tactile pad of thumb, repair for loss of, 97: 238
Tape, non-irritating, multipurpose surgical adhesive, 100: 789
Tattooing the cornea, 95: 246
Teflon
in blood vessels, study of, 95: 3, 16
in replacement of aortic and arterial segments, 100: 389
Temporomandibular joint, surgery of, 95: 263
Tendinitis, calcific, and painful shoulders, 95: 527
Tendon
extensor pollicis longus, delayed spontaneous rupture of, 96: 434
quadriceps, rupture of, 95: 626
Tendons and nerves, forceps for repair of, 97: 87
Teratoma, sacrococcygeal, 95: 1015
Test for serum amylase, simple, rapid screening, 100: 5
Testicle, tumors of, 95: 445
Testis
cancer of, treated by lymphadenectomy via transperitoneal approach, 97: 756
tumors of, 95: 341
Tetanus
antitoxin in acute injuries, 95: 664
postoperative, 100: 737
Tetracycline in cancer, the deposition and retention of, 100: 384
Tetracyclines, systemic, and ultraviolet in cancer detection, 96: 415
Texas City disaster, follow-up medical survey of, 97: 604
Thiersch's operation for rectal prolapse, 100: 457
Thigh, pelvis and hip, athletic injuries to, 98: 451
Thoracic
esophagus, restoration of, with aortic homograft, 96: 38
surgery, hypothermia in, 96: 137
Thoracoabdominal surgery, hypothermia in, 96: 137
Thoracotomy
complicated by rupture of stainless steel retention sutures, 96: 43
followed by fatal bone marrow embolism, 95: 94
right anterolateral, in repair of interatrial defects, 100: 455
Thorax and abdomen, athletic injuries to, 98: 447
Thorotrast, danger from, in intracranial angiography, 95: 469
Thrombophlebitis, subacute, and varicose ulcers, 95: 434
Thrombosis of terminal aorta and horseshoe kidney, 95: 990
Thumb
loss of tactile pad of, 97: 238
reconstruction of, 95: 168
Thymectomy in myasthenia gravis, 98: 196
Thymomas, current concepts of, 98: 202
Thymus and surgery, 95: 366
Thyroid
cancer of, 98: 190
carcinoma of, 95: 45; 96: 272
papillary carcinoma of, in children, 96: 27
patients, young, presence of Chvostek sign in, 96: 33
tumors of, 95: 40, 385
Tibia
fractures, of intercondylar eminence of, 95: 593
of shaft of, 97: 543
open fractures of shaft of, 95: 415
shaft of, conservative treatment of fractures of, 98: 593
Tic douloureaux relieved by physical therapeutic measures, 95: 81
Tissue
committee, appendix and small hospital, 96: 693
defects, plastic prosthesis for repair of, 97: 629
transplantation of, 98: 55
Toe-to-thumb transplant with nerve graft, 95: 315
Tongue
anterior part of, squamous cell carcinoma of, 98: 677
fibrosarcoma of, 96: 711
Tornado disaster, Dallas, 95: 501
Torsion of the spermatic cord (CAC), 100: 648
Trachea
constriction of, due to arterial anomalies of aortic arch, 96: 228
intrathoracic, resection of, 97: 354
Tracheoesophageal fistula, recurrent, 100: 110
Tracheomediastinotomy, 97: 324
Tracheostomy, elective, in infants and children, 98: 880
Traffic
accidents, first-aid equipment for, 97: 627
casualties, preliminary management of, 98: 539

Traffic
safety and related injuries, symposium on, 98: 517–583
promotion of, by automobile industry, 98: 555
Trainer, place of, in modern athletics, 98: 337
Transplant of tissues, 98: 55
Transportation of injured, 98: 534
Trauma
and concomitant disease, 95: 897
and joint action, 98: 583
and society, need for accident prevention programs for, 98: 559
and spondylolysis, 95: 466
blunt, and delayed spontaneous rupture of extensor pollicis longus tendon, 96: 434
closed chest, complications of, 97: 563
in the aged, 97: 63
laryngeal, and its complications, 97: 513
maxillofacial, and frontal sinus, 98: 796
nonpenetrating, to biliary tract, 97: 113
prevention of, 95: 718
sutures for, 95: 512
teaching of, in medical schools, 98: 566
to abdomen causing intramural hematoma of duodenum, 96: 568
diagnostic and prognostic factors in, 97: 575
to abdominal wall causing hernia, 97: 340
to major gastroduodenal artery producing aneurysm, 96: 115
to superior vena cava by stabbing, 96: 458
treatment of, need for resident training in, 98: 519
twenty years and after (E), 95: 489
Triethylenethiophosphoramide for malignant melanoma, 95: 994
Trypsin for swellings of head and neck, 96: 787
Tube
graft for repair of palatal defect, 95: 301
pedicle graft, unusual aspects of, 95: 287
Tumor
abdominal, caused by imperforate hymen, 95: 487
adrenal, 95: 914
malignant ovarian, with ascites and hydrothorax simulating Meigs' syndrome, 95: 480
of adrenal glands, 95: 353
of carotid body, 95: 371
of neck and extracranial meningioma, 100: 486
of parathyroid glands, 95: 395
of testicle in childhood, 95: 445
of testis, 95: 341
of thyroid, 95: 385
diagnosis of, 95: 40
ovarian, 95: 336
ulcerogenic, of pancreas, 95: 359
Tumors
argentaffine, of jejunum with perforation, 97: 784
bilateral mixed, of parotid gland, 97: 698
carcinoid, of rectum, 98: 243
ectopic mixed salivary, of lips, 96: 506
endocrine, and peptic ulceration, 100: 764
giant cell, of bone, 96: 479
Tumors
islet cell, of pancreas with gastrojujunocolic fistula, 96: 98
malignant, of head and neck, 98: 858
of chest wall, repair of, 100: 126
of deep lobe of parotid gland, 100: 323
of extrahepatic biliary system, 97: 141
of hand, 100: 293
of major salivary glands, 98: 904
of salivary gland, radiation therapy for, 98: 912
parotid, 100: 805
removal of, 96: 771
Tumors, tested for fluorescence, 96: 415
tracheal, resection of intrathoracic trachea for, 97: 354
ulcerogenic, of pancreas, 97: 92

Ulcer
acute perforated duodenal, vagotomy and pyloroplasty for, 100: 245
and phlebitis, muscle adenylic acid as preoperative adjunct to surgery for, 97: 696
chronic duodenal, Billroth I gastric resection for, 100: 251
gastric and duodenal, spontaneous perforations of, 97: 796
obstructing, gastric atonia and delayed gastric emptying after vagotomy for, 98: 612
peptic, observations on surgical treatment of, 97: 709
with endocrine tumors, 100: 764
perforated duodenal, in infant with survival, 97: 346
peptic, and right subphrenic abscess (DC), 97: 800
problems in management of (E), 98: 1
Ulceration of mucous membrane in gastric lipoma, 96: 453
Ulcerogenic
non-beta cell pancreatic islet carcinoma, 100: 48
tumors of pancreas, 95: 359
Ultraviolet and systemic tetracyclines in cancer detection, 96: 415
Umbilicus
hernia of, repaired by imbrication, 98: 236
preservation of dimple of, after hernial repair, 98: 236
Ureter, injuries to, 97: 558
Urinary
bladder, neurofibroma of, 97: 108
diversion, regression of vesical carcinoma after, 100: 133
incontinence, stress, in female, 96: 264
Urology, Bricker operation in, 96: 254
Uropathy, obstructive, and prostatic hypertrophy (CAC), 100: 643
Uterine fibroids, sarcoma developing in, 100: 416
Uterus, carcinosarcoma of, 100: 522

Vagina
hysterectomy through, 98: 25
plastic surgery of, 95: 425, 793; 96: 76

Vagotomy
and pyloroplasty for perforated duodenal ulcer, 100: 245
for obstructing ulcer, gastric atonia and delayed gastric emptying after, 98: 612
Varices, esophageal, hemorrhage from, 96: 110
Varicose ulcers and subacute thrombophlebitis, 95: 434
Vascular
changes after operative destruction of capsular and periosteal hip vessels, 97: 494
dynamics during hemorrhagic shock and therapy, 95: 659
lesions, effect of vitamin A, niacin and riboflavin on, 95: 438
prostheses, importance of porosity in, 100: 557
supply, controlled limitation of, for regression of neoplasms, 96: 771
Vasectomist, perils and pitfalls of, 97: 84
Vein, mesenteric, occlusion of, 96: 565
Veins, major, injuries to, 100: 171
Velopharynx, cleft muscular, surgical management of, 98: 816
Vena cava, superior,
obstruction of, 96: 353
through and through laceration of, 96: 458
Ventilator, expired air, 97: 407
Vertebrae
cervical, occult fractures of smaller elements of, 97: 530
fusion of bodies of, for ruptured cervical discs, 98: 722
upper cervical, anterolateral approach to, 97: 766
Vesicoureteral reflux, significance of, 100: 527
Vitallium implant for transected portion of mandible, 96: 768
Vitamin A, effect of, on vascular lesions, 95: 438
Volkmann's ischemia, impending, 100: 635
Volvulus
acute, of cecum, 95: 798
intermittent, of right colon, 97: 316
of cecum, 96: 411
or ascending colon, 98: 175
of right colon complicating subhepatic cecum, 97: 793
of transverse colon, 96: 122
organoaxial, of stomach, 96: 600
von Recklinghausen's disease and neurofibroma of rectum, 95: 474
Vulvectomy, indications for, 97: 690

Walter, Albert G., 19th century pioneer in trauma surgery, 97: 624
War, total, medical education in, 95: 493
Whiplash injury, fallacy of term, 97: 522
Wire-button retention technic, primary closure of pilonidal cysts and/or sinuses with, 97: 328
Wire fixation, Kirschner, of bone plates in craniotomies, 96: 701
Wound
perforating, of two chambers of heart with survival, 97: 344
surgical, treatment of, 97: 429
routine culture of, 98: 152
Wringer injury (CAC), 100: 646
Wrist, elbow, forearm and hand, athletic injuries to, 98: 432

Zenker's diverticulum, 97: 222
Z-plasty and multiple excision for disabilities of exposed surfaces, 95: 173
Zygoma and orbit, fractures of, 96: 735